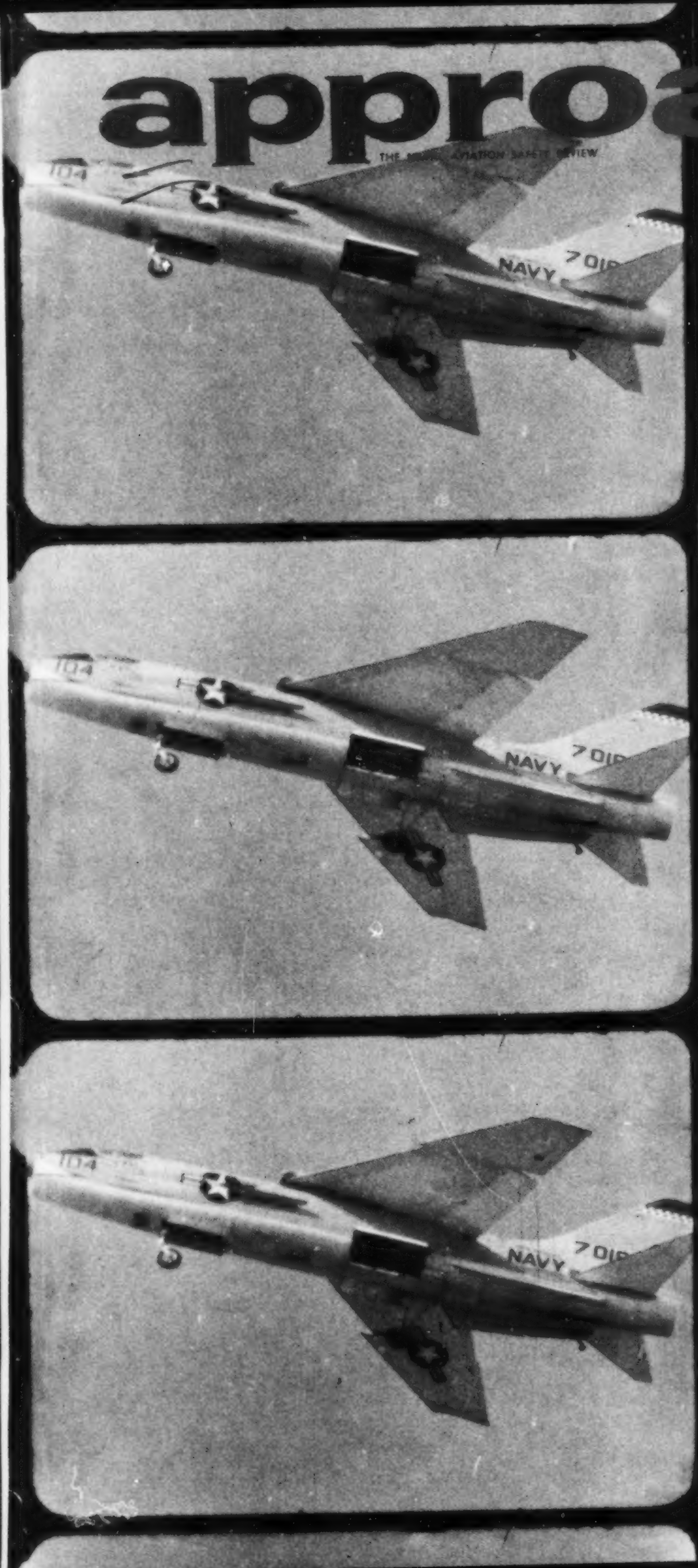
approach

THE [illegible] AVIATION SAFETY REVIEW

V9
#12



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CHINESE LANDINGS

wun hung up

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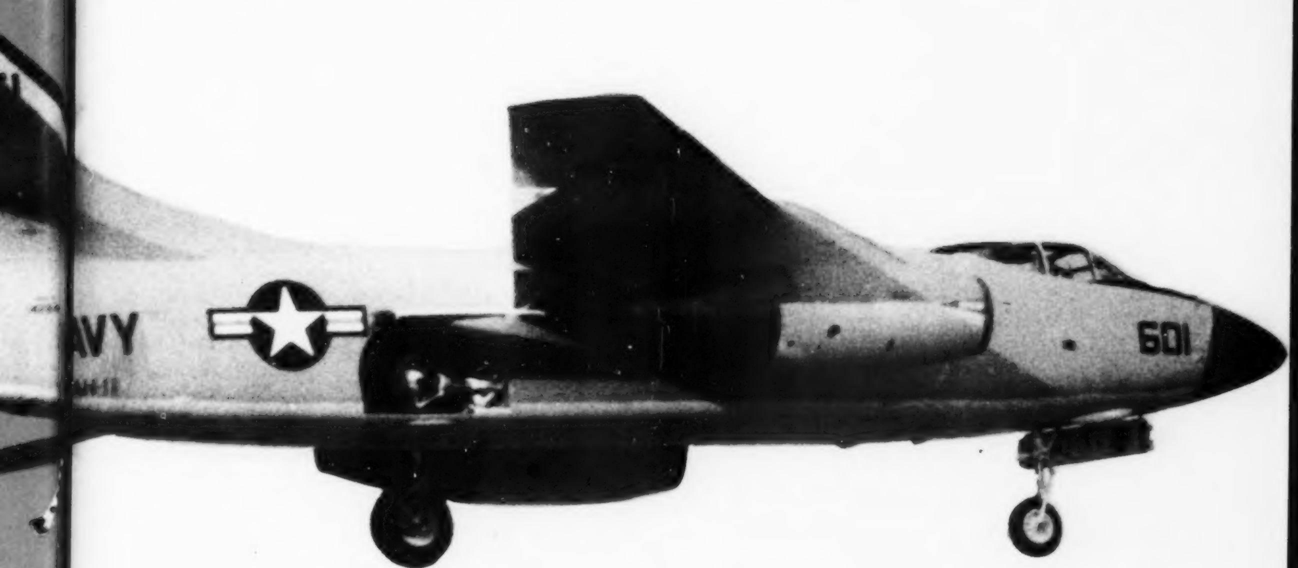
At first glance "Wun Hung Up" landings might show a certain similarity to a maneuver well known to flight instructors as "Wun Wing Low" landings. The similarity, however, ends with the name.

Where the Wun Wing Low is an erratic wing wobble at touchdown due to inexperience or inattention, the Wun Hung Up is a failure of one main landing gear and is an emergency situation requiring skill and precision flying.

The nose wheel-up landing was covered several months ago (November '63) so our present interest is limited to main gear failures where the landing is made ashore. Various types of failures are lumped together (one main broken off, jammed in up or intermediate position, unsafe and unlocked). The main intent is to take a look at the frequency of occurrence, guidance provided the pilots and the actions of the airplanes involved.

This look covers about 85 pilots who have experienced main landing gear failures in the last four years. Two were student pilots in F-11s. Both ejected successfully and that was considered the wisest choice under the circumstances (night in one case and low time in model in the other). The remainder rode their airplane to the runway.

In this connection it is of interest to note that for certain aircraft, when one main gear is hung up, the recommended procedure is to retract all wheels and belly land. Without wanting



For outcome of this emergency see picture page 7.

it, a qualification creeps into the subject.

It will be easier to start with those models in which the recommended or accepted procedure is to go ahead and try a landing with one main and nose gear extended and "Wun Hung Up." The picture may be helped by a few statistics.

Out of 29 accidents, 14 had their origin in damage received during carrier ops, 10 on landing with subsequent bolter and bingo, and four during launch. In addition, one was precipitated by gear damage during MLP. Therefore, we have 14 remaining accidents where maintenance/material factor forced a pilot to land with one main gear malfunctioning.

With one main gear up the airplane sags on the unsupported side and the ensuing swerve may be gentle or wild. When the dust settles a hoisting sling and crane are a necessary part of the salvage equipment. Damage there will be, but not always enough to classify the occurrence as an accident. In fact there is better than an even chance that it can be an incident since we have 25 of them, the majority resulting from maintenance/material factors. But don't make bets in advance whether it will be an accident or incident. There seems to be no positive criteria for forecasting the outcome as far as aircraft damage is concerned.

Injury from Wun Hung Up landings is limited to a fatal accident in 1960. This is considered an isolated case and some of the significant details will be covered later.

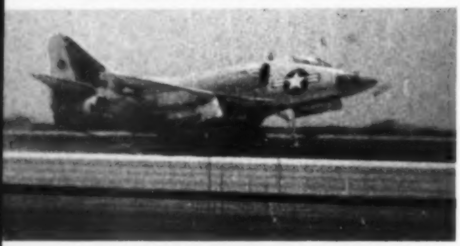
How about guidance for the pilot who experiences main landing gear trouble?

From an overall view, Flight Manuals and NATOPS provide specific and detailed information. There are, however, a few exceptions where guidance is lacking or limited. In one case, there is even basic disagreement between NATOPS and the Flight Manual. Disagreement can be solved by sticking to NATOPS. Lack of information is of more concern.

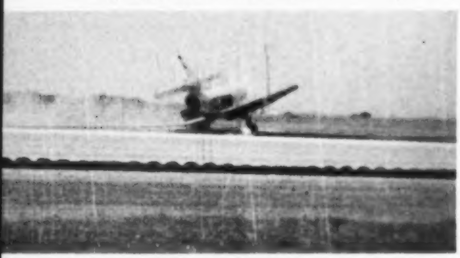
Before discussing any particular model a review of general techniques is worthwhile.

As mentioned previously, when some aircraft experience

Left main is broken free—

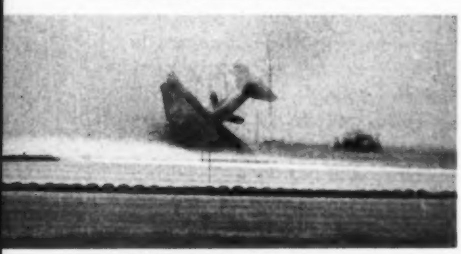


wing sags after arrestment—



severe swerve sets in—

nose hits chain at side—



tail tilts skyward and it looks like "bottoms up."

trouble with one main gear the treatment is to retract all gear and belly land.

Why this method? For the answer we must compare the action of an aircraft making a belly landing and a touchdown with "Wun Hung Up." A slide-out on the belly is generally straight down the runway with possibly a gradual arcing at the end of the slide. The path of the aircraft is predictable to the point that you can assume it will stop on the runway.

On the other hand, when one main is up we know there will be a swerve but where, when and how much is unpredictable. In contrast to the belly landing, it is wiser to assume that the aircraft will go off the side of the runway. Use of arresting gear greatly improves the chances of staying on the runway but it is not a guarantee. For planning purposes the best benefit of arresting gear is to localize the swerve area, giving a chance to get crash trucks on the scene quick.

Remember that we are speaking in *general* terms. And in general terms the answer to the question of technique is another question: Can you afford to take the chance of leaving the runway?

Now the specifics of an individual situation come into play. What is the condition of the terrain next to the runway and are obstacles or drop-offs located on the swerve side? What is the size, mission and design of the aircraft involved? What are ground facilities and is it night or day? How many people are aboard the aircraft and what is their status (passenger, crew or student pilot)?

Navy transport flight manuals

A-4 finally stops right side up. Pilot could not retract all gear and had NATOPS choice of ejection or landing. Sequence shows hazard and need for ideal conditions.

recommend a belly landing in preference to a "Wun Hung Up" and most training aircraft follow the same procedure. If it is not evident why this approach was taken for these aircraft, consider the general characteristics of those which are "approved" for landing with one main up:

F-1 (Series)	F-8	A-3
F-3	F-9 (Series)	A-5
F-4	F-11	A-6

As can be seen, all are tailhook-designed jets, relatively solid and compact. A minimum number of seats are aboard and those are for crew not casual passengers.

As a matter of interest, the F-1, F-4, F-9, and F-11 would automatically be in this list since they cannot retract the gear once emergency lowering procedures have been accomplished.

On some models there is enough information to enable us to summarize the past with a view of the future.

Right main gear and tailhook were torn off on ramp strike. Night landing complicated situation. F-8 dropped off cliff where beach curves close to runway. No injury to pilot.

F-8

Out of 14 one-main-up landings only four were incidents. Of the 10 accidents, five started with a CV landing and bolter and three were from a cat shot.

- Arrestments: 12 attempted and 10 successful (one pendant parted and one aircraft missed the wire).
- Of 10 arrestments seven aircraft stopped on the runway. One stopped 300 feet off the side and there was no data on two.
- Of four non-arrestments none stopped on the runway. Distances off the runway were: 125, 200, and 200 feet. One would have gone an estimated 350 feet if it had not dropped over the cliff at Guantanamo.
- Figures from two non-arrestments indicate the wings can be held level for 1500 to 2000 feet.
- Stopping on the runway indicates less total damage to the aircraft. Out of seven which did, there is only one "overhaul" damage. Out of seven which went off the runway there are three overhauls and one strike.
- The runway was foamed for nine aircraft.

F-3

Out of a total of six one-main-up landings four were incidents. The two accidents originated with a ramp strike and a cat shot.

- Arrestments: six attempted and all successful.
- Of the six, two stopped on the runway, one just off the runway, one 80 feet off the side and there was no data on two aircraft.
- Foam was used in only three cases.

F-9

A total of nine aircraft had main gear malfunctions and one retracted all gear for a belly landing (incident damage).

- Of the eight one-main-up landings five were accidents, two from carrier landings.
- Arrestments: five attempted and four successful (hook broke loose on the unsuccessful attempt).
- Of the four successful arrestments three stopped off the runway and there was no data on one (it was an incident and due to the low number of man-hours estimated for repair the aircraft may have stopped on the runway). Distances off the run-

way were 10, 20, and 300 feet.

- Foam was used in five cases.
- On a free roll the wingtip was kept off the runway for 2000 feet in three cases and the total ground roll ran from 3000 feet to 3400 feet.
- Nose wheel damage from crossing chain arresting gear was mentioned twice.

A-3

Out of five one-main-up landings there were three accidents and two incidents. Of the three accidents two started with a CV landing.

- Arrestments: four attempted and all successful.
- Of the four arrestments, one aircraft stopped on runway, one on runway edge and there were no details on two arrestments. These last two aircraft apparently stopped on the runway since they were classed as incidents.
- The runway was foamed for 4 aircraft.
- The one "free run" aircraft rolled about 3000 feet before the tip began dragging. Tip drag was about 500 feet but the swerve was gradual since the tail was still over the runway when the aircraft stopped (80 degrees off runway heading).

Incident damage resulted from A-6 landing with one-main-up. No arresting gear was available nor was foam laid on runway.

F-1

A total of 10 aircraft had a malfunction with one main gear, One retracted all gear and landed wheels-up (classed as an incident).

- Of the nine one-main-up landings seven were incidents.
- Arrestments: nine attempted and one unsuccessful (aircraft missed wire).
- Of eight successful engagements six aircraft stopped on the runway.
- One stopped 10 feet off the side and the other stopped 300 feet off the side.
- In the one unsuccessful arrestment the aircraft stopped about 200 feet off the side. It rolled 2600 feet before the wingtip touched.
- Foam was used in three cases.

Some trends which emerge from this study are:

Foam is not always necessary but if used it should be spread on the swerve side. In this case foam was poorly placed.

Another view of A-6 shows cross-country characteristics of aircraft. Suitable terrain next to runway prevented damage.

- Arresting gear is a proven method of handling "Wun Hung Up" landings. Without arrestment the aircraft is almost sure to go off the side (The F-9 will probably go off even with arrestment).
- Even in daylight with an LSO assisting, a wire is not guaranteed on the first pass. You have to be prepared to bolter and try again. Shortfield and midfield gear is preferable to abort gear which may not allow a successful bolter.
- Foam seems to be used more often with certain models but accident boards did not comment on its absence as being significant: Usually the aircraft was in the foam strip a very short time once the wingtip touched the runway and the swerve set in so foam may not be necessary. If it is used, note that several boards felt a curved strip of foam was most useful with emphasis on the side of the runway instead of the center.

For other models approved for "Wun Hung Up" landings, we have limited information on two F-11s, one A-6, and one F-4. No A-5 cases are available.

The F-11s made arrested landings. One stayed on the runway and ended up with a bent wingtip. The other swerved off the side and received slight damage to the nose and main gear from crossing the arresting gear chain. No arresting gear was available for the A-6. Its total roll was 6500 feet and stopped well off the side of the runway with incident damage.

The F-4 pilot in question found himself with a hung right gear and recycled, pulled G, tried emergency lowering, and yawing to get all down. He was unsuccessful and accomplished a belly landing on a foamed strip without using arresting gear. Incident damage resulted.

It is time now to mention the exceptions. The F-6 and A-4 fall into the classification which could allow landings with one main up; however, they should be belly landed. This is due to design features which make them more unstable than their kin, plus an external tank configuration which improves wheels-up landing characteristics.

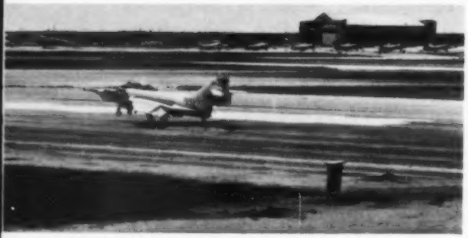
Other "exceptions" are those models where no pilot guidance is furnished in NATOPS or the flight manual: the P-2, F-10, A-1 and TC-45J.

Let's take the P-2 first. Consider its characteristics. It seems to fit best into the transport class where a belly landing is preferable. Two P-2 crews have faced a "Wun Hung Up" and in both cases the decision was to retract and belly land. Damage warranted accident reports but there was no disagreement on technique from reviewing authorities.

As a tailhook-designed jet, the F-10 might reasonably go into the one-up approved group. Design, however, sneaks in and makes it more successful as a belly-lander. Three cases have resulted in three incidents (there is further proof in some inadvertent gear-up landings being called incidents).

The last two aircraft, the A-1 and TC-45J, are only similar in landing gear arrangement but they can be lumped together with the recommendation for a belly landing should one main gear malfunction. In the case of the *Beech* we have very little to go on except the number of inadvertent gear up landings: From an overall view the lack of injuries and relatively limited damage from belly landings prompts the recommendation.

In the last four years there have been four A-1's airborne with one gear off or hanging free. Two made belly landings and two completed a "Wun Hung Up." In each category there was one incident and one

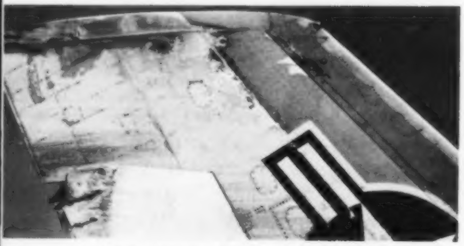


Initial touchdown on approach—

right wing drops into foam—

plane begins swerve off side—

ends slide in grass area—



incident damage to wing tip.

accident. This is a fifty-fifty deal. What tips the scale are the collective feelings of the accident (and incident) boards. Three out of four felt that in the future all should be belly landings.

Earlier we gave a box score of true "Wun Hung Up" landings (29 accidents and 25 incidents). We must give equal time to those cases where one main landing gear malfunctioned but all wheels were retracted in preparation for a belly landing. There are a total of 29 such cases. The results were seven accidents and 22 incidents.

This is a high proportion of incidents. On the surface it might appear that belly landings are preferable. However, bare figures do not tell the whole story.

It is established that belly landings in the A-4 consistently produce incidents (normally the actual touchdown is made on external tanks). Almost half the incidents are from A-4s. Three incidents are from the F-10, another successful belly lander, and two more are by the F-6. These three models account for 70 percent of the incidents — inherent design is more responsible than the fact of a belly landing.

The remaining incidents form a diverse collection of models: one each F-1, F-4, F-9, A-1, and two T-28s.

Of the six belly landings resulting in an accident classification there are two P-2s, one each C-121, S-2, A-1, C-117 and T-28.

While on the subject of belly landings there is a small group of aircraft where it was impossible to get any of the wheels down and the pilot had no choice. In incidents we have one T-33, two T-2s, and two T-34s. Accidents include one each T-28 and A-4 (wiped out the gear on attempted field landing and waved off to land later on foam strip). All told, 15 different models have been mentioned which made belly-landings following a gear malfunction.

As we can see from past history, the guidance provided to pilots on handling one-main-up trouble is responsible and realistic. But there are variables in each case, and because there are variables one board commented that there should be no rigid rules. The man on the spot needs some freedom in decision making.

This freedom needs to be used carefully when the airplane has come to a stop and the paperwork begins. A single case, where the airplane does not follow the general rule, may bring a local recommendation for a change in procedure which is at variance with accepted procedure. Such a change must be matched against the normal pattern to determine if it is progress or a tangent based on a freak occurrence.

In a recent F-9 arrestment with one main gear up the accident board pointed out that "contact of the nose gear with the anchor chain portion of the arresting gear caused damage requiring classification as an accident." This assumes the result would have only been an incident if the aircraft had not been arrested and it is true that this has happened before. Consequently the squadron skipper recommended that NATOPS delete midfield chain arrestments of one main gear unsafe or up.

The station C. O. agreed that midfield chain arresting gear is at times conducive to some damage during engagement with this particular aircraft configuration. "However," he added, "it is considered that greater damage would likely result if the midfield gear were not used. The overall benefit of engagement for the majority of aircraft configurations far outweigh this minor disadvantage."

Another endorser said that even if some damage is incurred chain gear should be used if nothing else is available (morest, water squeeze), since "safety of the pilot must be the governing factor."

This last quote is sufficient background to lead us into a couple of gray areas.

One of these areas involves bounce landings to try to force a reluctant wheel out of the well or into a down position. You can get opinions "for" and "against" such a procedure but it seems to be a fruitless effort. Based on reports received, there are so few successful cases that it would seem to be an oddity when a bounce cures a "Wun Hung Up."

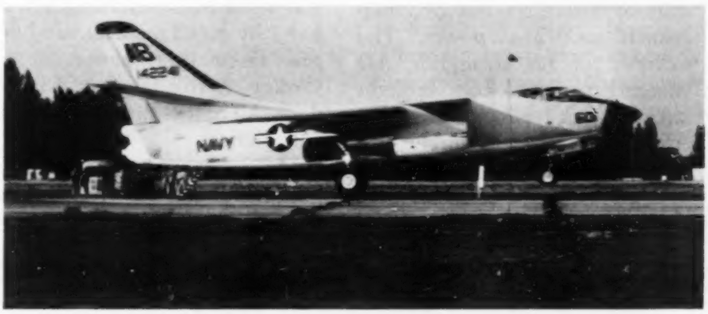
Another gray area concerns unsafe gear indications. The rule of thumb is to handle it as if the wheel were up or unlocked. During daylight an air check or a pass by the tower gives a fairly clear cut opinion of the position of the wheel. If it is snug in the well or at half-mast your decision is also clear cut – follow recommended procedures for a "Wun Hung Up."

But, if the gear strut *appears* down and *apparently* locked it is like getting a fire warning light without any smoke or flame. Maybe it's just a faulty indicator – maybe.

At night the unsafe indication is complicated by the fact that air checks are an unwarranted risk. A pass by the tower or LSO platform often brings inconclusive information about the position of the wheel.

How do you handle it? Prepare for worst, or hope for the best?

"Hoping for the best" resulted in the single injury associated with main gear trouble. Several years back an A-4 pilot had an unsafe left main landing gear when he arrived at his destination. He recycled without changing the left gear unsafe. An air check showed the strut to be down but it was after sunset and the poor light prevented a close inspection.



Both main wheels were unsafe and collapsed on touchdown. Preparation included foam strip, arresting gear and LSO. Heads-up handling of situation produced incident damage.

The pilot decided to land with gear handle DOWN and the left indicator showing UNSAFE. Arresting gear was unavailable. Touchdown was planned for the right side of the runway.

As soon as the left wheel made contact it collapsed (the left external tank began dragging 45 feet from touchdown.) A straight run was maintained for a short distance but the inevitable swerve soon set in. The aircraft angled across the centerline and as the swerve tightened it went off the runway 1700 feet from touchdown.

There was construction in the close vicinity of the shoulder and upon striking an open ditch the aircraft structure ruptured and exploded.

At this period the A-4 had already begun to make its reputation as a docile machine in a belly landing and not surprisingly the accident board made a strong recommendation that if the gear is unsafe all gear should be retracted in preparation for a belly landing.

This A-4 recommendation obviously can not hold good for all models which encounter an unsafe indication. However, general prudence in handling an unsafe indication can be applied to all models. Instead of a bounce landing, some pilots have made a careful touch-and-go to see if the gear will support the weight of the aircraft. Use of arresting gear is not uncommon with an unsafe gear. The exact way you handle it will vary with the air situation and ground facilities. But planning for the worst will not be wrong. Then you can hope for the best – that just a bad indicator is involved.

Personal Thoughts on a 'Wun Hung Up' Situation

by LT Clifford M. Johns

The damned thing wouldn't work. It was becoming apparent after the umpteenth try that the right main landing gear was not going to come down.

It happened at the end of a combination glide bombing/FCLP mission. I was section leader in a flight of four A-1H aircraft and after the break-up at home field I went through the normal procedure for the "Able Dog," concentrating on getting a good interval and abeam position. Then my wingman called and told me that my right main landing gear was not down.

Even as I reached forward to recheck the gear handle I looked outside and saw what I was afraid I would see. Only one "knuckle" (gear cover) was visible.

Fuel was no problem so I told the tower of my problem and went out over an unpopulated area and began what was to be a long session of cycling the gear handle under every possible attitude and G force combination. Nothing helped. Finally the tech rep came on the air and informed me that the telescoping rod must have failed and that there was no hope of getting the right gear down.

There was nothing to do but burn down my fuel and prepare to make a wheels up landing on a foamed runway into the arresting gear.

During those past minutes I had plenty of time to think. It's peculiar the way the mind works. A lifetime of experience flashes by in seconds—provided there is some stimulus to make the mind work that fast. And mine was racing.

I was really thinking on two levels I suppose. My practical self was considering landing techniques, airspeeds, check-off lists, the length of my straight-a-way, the fastest way to exit the aircraft, and so on. But my reflective self was fleeting back and forth across events of the past, some tragic, some thrilling and some satisfying – the sort of things that stick with you forever. There didn't seem to be any real pattern or logic to this thought. It was related only in that each remembrance was vivid, real and near.

I remembered when my roommate was lost: sitting in the standby aircraft I watched him launch and lose power. The memory of his struggling AD staggering off the bow brought back the sick feeling of the sight. And I remembered the time it almost happened to me, with a heavy load and a too-short deck run. I could feel the airplane sagging. There was a fear of holding too much back pressure on the stick. When the wave tops began to fall away I remember the almost explosive relief of having made it all right.

Another remembrance was not a specific event but a feeling squeezed out of all the night flying off the ship: dark nights and the insecure, rather lost feeling this produced (though none of the squadron pilots would ever admit it) trying to get aboard through what seemed like a confused landing pattern with aircraft trying to fit into the bolter pattern and someone calling low state. Mainly it was the darkness I remembered and the wondering if, after all, it was worth it.

My answer seemed to come during one recycle of the gear handle, that time with six positive Gs on the plane. I had time to remember the thrill, the wild dancing glee of the first T-28 trap aboard ship. I remembered the singing and shouting to myself like a kid at Christmas as I cleared the bow on my deck run. Somehow this had been a symbol of success in a long struggle to get my wings.

And as I orbited and thought about how I was going to land wheels-up and what I needed to do to minimize the damage to the aircraft, I also thought of the wonderful experience of flying: The Isle of Capri, a green emerald standing from a blue-green sea in the morning sun as I slid by on a low level nav hop; the fascinating panorama of Turkey from 200 feet off the deck. All of it really had a broadening effect.

My reverie had just tackled some grumpy thoughts about how ungrateful it was of the old *Able Dog* to do this to me after five years of mutual trust and friendship when the Skipper came up on the radio and said it was time to land.

The LSO and I talked for a moment and it was reassuring to know that he was down there. He recommended a long straight-a-way and 90 knots over the threshold. I made one low pass over the runway to sort of get my feet wet (a delaying action, I suppose the psychologists would call it) and checked the fire trucks at the beginning of the foam strip.

After a wide turn downwind I carefully, almost meticulously, went over my landing check list; hook and flaps down, gear handle UP (that surely seemed odd), prop full forward. I double checked the mixture and boost pump, tugged the shoulder harness even tighter and out of habit checked the tail wheel locked.

As I turned off a wide beam position I again thought about making a fast exit when the plane stopped. I wondered how rough the landing would be and momentarily worried about fire.

At a deep 90-degree spot I instinctively reached for the landing gear handle to double check it down. It was not there and that gave me a momentary start. It was difficult to refrain from lowering the handle.

Now I was ready in all respects. Everything had been checked. I was confident I could do this thing, that I could do as well as anyone could expect and that I could walk safely away afterward.

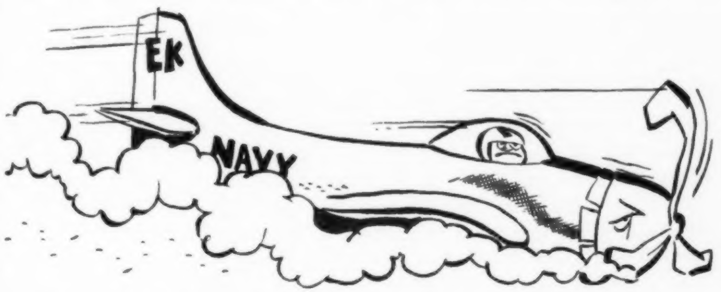
At a 45-degree position the LSO told me I looked good and I could slow it up a little if I wanted to (he's not normally that polite). I pulled off two inches of manifold pressure and slowed to 87 knots.

As I reached the foam area the LSO said "ease power." I held what I had on the stick knowing that a rate of descent was built in and as the runway came up I eased back on the stick. I felt like I was sailing over the arresting gear. After what seemed forever I felt the tail section rub the runway very gently.

The next thing I recall was sliding down the runway, still very gently it seemed, seeing the prop dig up great chunks of asphalt which went flying toward my face.

I slid on and on, certain that I had missed the cable. But just at that moment the aircraft began to slow and turn slightly to the right. Instinctively I tapped left brake, pushing left rudder. This had no effect and I stomped on the left brake until I realized what I was doing. At this point I sort of sat back and relaxed, laughing at myself.

That spell was quickly broken as dark gray smoke began to billow up from the floorboards. The aircraft had stopped sliding. My instinct was to abandon ship as rapidly as possible. I released the seat belt and parachute harness and bolted for the wing. A stunning blow on my head jarred my spine all the way to the bottom. I had forgotten to open the canopy. The LSO had reminded me twice about this but I chose to wait until after the 90 position so that I might hear radio transmissions better. Fortunately nothing had happened to the hydraulic system and the canopy opened just as a big cloud of smoke swirled into my face. I headed for the wing again.



This time I got a buggy whip reaction to my neck and I was jerked back into the seat. Second mistake. I had forgotten to disconnect my radio cords. Feeling somewhat frustrated and stupid, I jerked these loose, jumped on the wing and proceeded to make designs on the 100-yard dash record. This effort went along nicely until I made a broad jump off the end of the wing into the foam. From an attempted track record I changed to ice skating in a sitting position and slid gracefully into the grass off the edge of the runway.

That night over a cold beer I did some thinking. First of all, an actual experience is quite different from an impersonal statistical study and small items can trip you up, i.e. canopy and radio cords. But to the extent that I had been successful, my training had paid off.

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The Professional Approach
or
HELO HIGHLINE

By LTJG R. J. Durant

The hovering drop on a moving ship is easily the most demanding maneuver in helicopter flying. Here you will encounter extremely limited operating space, often combined with near maximum power requirements. The drop area will be moving up, down, sideways, as well as forward through the water. Given a small ship and a rough sea, this can be mighty hairy.

What are the basic considerations when hovering over a small ship such as a destroyer? First, for control purposes, we want to hover into the wind. But we must also place the hoist cable over the drop area and at the same time keep the blades clear of the cranes and gun tubs. The pilot must also be in a position to see a good part of the ship and still be able to glance at his RPM/MP without excessive head movements.

These three conditions are satisfied best if the ship has a relative wind of 30 to 45 degrees to port. See diagram 1.

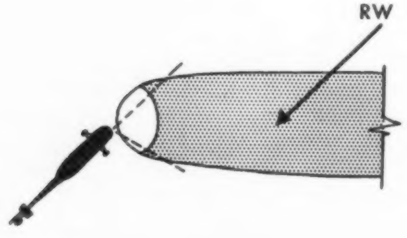

diagram 1

Notice that the pilot has an excellent view of the ship, the drop area, and the RPM/MP gage.

If you have enough room, a fore and aft hover is fine. The same principles apply. But notice what happens when you try to hover in other positions – your view of the ship diminishes or perhaps you end up watching the forward part. Let's look at some examples of hovering using various relative winds.

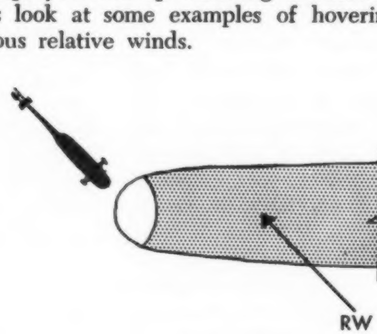

diagram 2

In diagram 2 the copilot should take it unless the area is so cramped that it is impossible to drop the hoist with the right side of the helo away from the drop area.

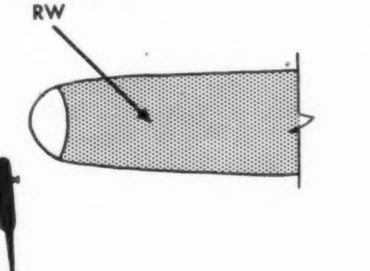

diagram 3

In diagram 3 the wind is from the port quarter.

Here, as in any other case, you may feel more comfortable turning slightly out of the wind. If you turned 30 degrees to the right for your hover heading, the rudder control difference would not be excessive, and the increased view of the ship and drop area would be valuable. In general, a 30-degree turn to either side of the windline won't hurt.

Let's back up a bit now and discuss the preliminary moves you must make before the drop. You will need radio contact, a proper flag hoist, and a green flag or paddle from the drop area. Establish radio contact as soon as possible. Fly completely around the ship at least once to check for obstructions, wires, antennas, flagstaffs, garbage and rags in the drop area, and wind direction. Only after you have carefully observed the drop area from all directions should you approach it.

Give yourself some straightaway and approach the drop area in the same general heading you intend to use for the drop. The approach angle should be the same as that for any shipboard landing. Remember that your crewman needs to see the drop area. Now is the time to check engine instruments, set up RPM, and check for hazards on the drop area. Stack gas can be very annoying, so shift a little out of the windline to avoid it. If the ship should decide to blow tubes while you are in the approach, you can go IFR temporarily. Also, the gas can bounce you around a bit.

Take it slow and easy in close to the ship. Listen to your crewman's directions. Be sure you are up to RPM just prior to hover. Always give yourself the benefit of the doubt in RPM.

Now say you are within a couple of inches of max MP. It's time to wave off and come back some other day. A 5-knot drop in the relative wind, or a little rudder kicking, or some rough control movements and the power required will shoot up past the engine limits.

A word for the copilot. Your job during this whole flight is to act as a second pair of eyes for the pilot. Watch for those flags and for all the effluvia on the drop area. In the hover spend most of your time on the engine instruments, and the RPM/MP. Keep your hand on the throttle and add or take off RPM as needed. This will help the pilot considerably, especially in tight situations where his attention is directed elsewhere. If the hover is in a fairly comfortable situation, you may be able to use simple hand signals to tell the pilot he should move left, right, back, forward, or to change RPM. For instance, a clockwise motion of your hand to indicate "increase the RPM." ICS use should be kept to a minimum, because it interferes with the crewman's directions and may cut out radio calls. Also, it is never a good idea to touch the cyclic, collective, or rudders in a hover. Your little "jolt" on the cyclic may be just enough to throw the pilot completely off.

This brings us to the problem of "taking it away" from the pilot or copilot, as the case may be. As the second pair of eyes in the cockpit you may see an unsafe condition developing of which the pilot is completely unaware. The decision to use the ICS, a handsignal, or to take actual physical control of the helicopter depends on your judgment at the time. As the copilot, you should always be thinking ahead and have a planned path for a waveoff or retreat from the ship if a dangerous situation should arise.

Tell the ship not to call you on the radio during the hover unless it is absolutely necessary. A simple call "beginning hover" and "drop completed" can signal the beginning and end of the silence period.

To clear ship at completion of pick-up or drop, back away from the ship *slowly* until you have about 30 feet clearance from the nearest obstacle. Now head straight into the relative wind, as a general rule. In conditions where relative wind and true wind tend to cancel each other out, it may be best to head into the true wind. This will be of assistance should an emergency occur.

Don't try to follow the ship's rolls. Stay level.

However, you must stay *over* the drop area at all times, and you must maintain a fairly constant height above the deck. This means following the pitching and yawing of the ship. In really rough seas, it is absolutely necessary to have a good view of most of the ship, as in the example of diagram 1. Hovering with an eye on the rail or a boom just won't work when the ship starts bobbing badly. Heavy seas go with heavy winds, so power is not usually a problem in these cases.

How high off the drop area should you be? The factors governing this are:

- clearance from obstructions
- amount of ship movement.

The closer you are to the deck, the quicker the

hoist can go up and down. Also, if you should happen to let a person fall, a 5-foot drop will do him less damage than a 10-foot drop. So, in general, it is desirable to hover as low as practical, keeping in mind the two conditions stated above.

So far we have only discussed drops on the fantail. Many ships will be unable to receive the helo aft, and you will have to drop on the forecastle or other forward area. (Diagrams 4 through 7) There is no essential difference between the two types of drops. Again, plan to hover in such a position that you have a good view of the ship. The ideal wind for a bow drop is 180 degrees reversed from the ideal fantail drop.

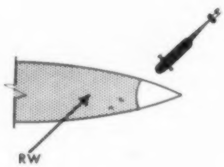

diagram 4

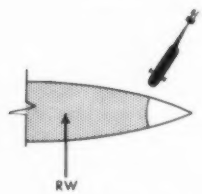

diagram 5

With a wind from the starboard beam, use a 30-degree to the right of windline hover heading, to give a good view of the ship. For a port wind, let the copilot take it.

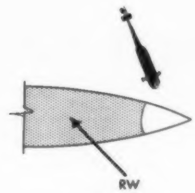

diagram 6

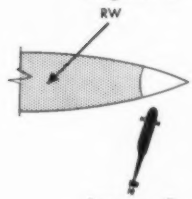

diagram 7

For winds forward of the beam, better count on hovering into the wind 30 degrees either side of windline, and watching the forward part of the ship. This will be more difficult because you will have a smaller visible area to use for a hovering reference.

In diagram 7 the copilot should take it.

Waveoff in a bow drop can usually be taken simply by moving forward into the relative wind. There is sometimes a tendency to let the ship drift toward you in this type waveoff, so keep your relative motion in mind.

In summary:

- Check drop area carefully.
- Plan hover heading and position for best drop.
- Watch power requirements

Ed — Since this info is possibly as useful to ship's personnel as pilots, extra copies can be forwarded on request to O-in-Cs of helo detachments for personal distribution to appropriate ship officers.

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Safety Isn't Something New

All through the ages, man has struggled for safety. Primitive man lived in caves or treetops to be safe from wild beasts and savage tribesmen. He had to be constantly on the alert to protect himself and his family from ever-lurking dangers. Those who survived learned to protect themselves by pulling up the ladder of vines or by rolling a rock before the mouth of their cave.

Gradually, man invented various weapons and tools, and made discoveries which brought greater comfort and safety. As civilization developed, most of the old hazards were overcome. Better homes were constructed. Bridges and roads were built which could be traveled with less fear of accident. Larger and safer ships sailed the seas. Through extinction and hunting the number of dangerous animals grew smaller.

Yet, as many of the natural dangers faced by men of earlier ages gradually disappeared, they were replaced by others which often proved to be even more dangerous. Machines created to serve man frequently became his destroyer. Man's ability to invent and construct machines has developed faster than his ability to use them safely. The automobile for example, kills thousands of people every year.

Most accidents are caused by carelessness and could be prevented. Many industrial plants have greatly reduced the number of accidents by placing the proper safety devices and guards on machines and by insisting upon orderliness and caution on the part of workers. Many cities have reduced the number of traffic accidents by proper law enforcement and by the education of motorists and pedestrians. If everybody used good judgment and exercised proper care, a large majority of accidents would never happen, and countless deaths and injuries would be avoided.

In the early days of aviation, airplanes and engines were crude and unreliable. Pilots had to teach themselves to fly. Learning by experience is ordinarily considered good, but learning to fly an airplane by experience alone was dangerous. Accidents often happened. Many persons were killed or injured because they were foolish enough to go for rides in crude aircraft with inexperienced pilots.

The large number of accidents in the early days of flying caused the U. S. government to set up controls on air traffic, the licensing of pilots and mechanics, and the licensing and inspecting of aircraft. Air lines, aircraft manufacturing companies, and pilots' groups also aided aviation safety by careful inspection of aircraft and by disseminating safety information to fliers. As a result, flying has increasingly become safer.

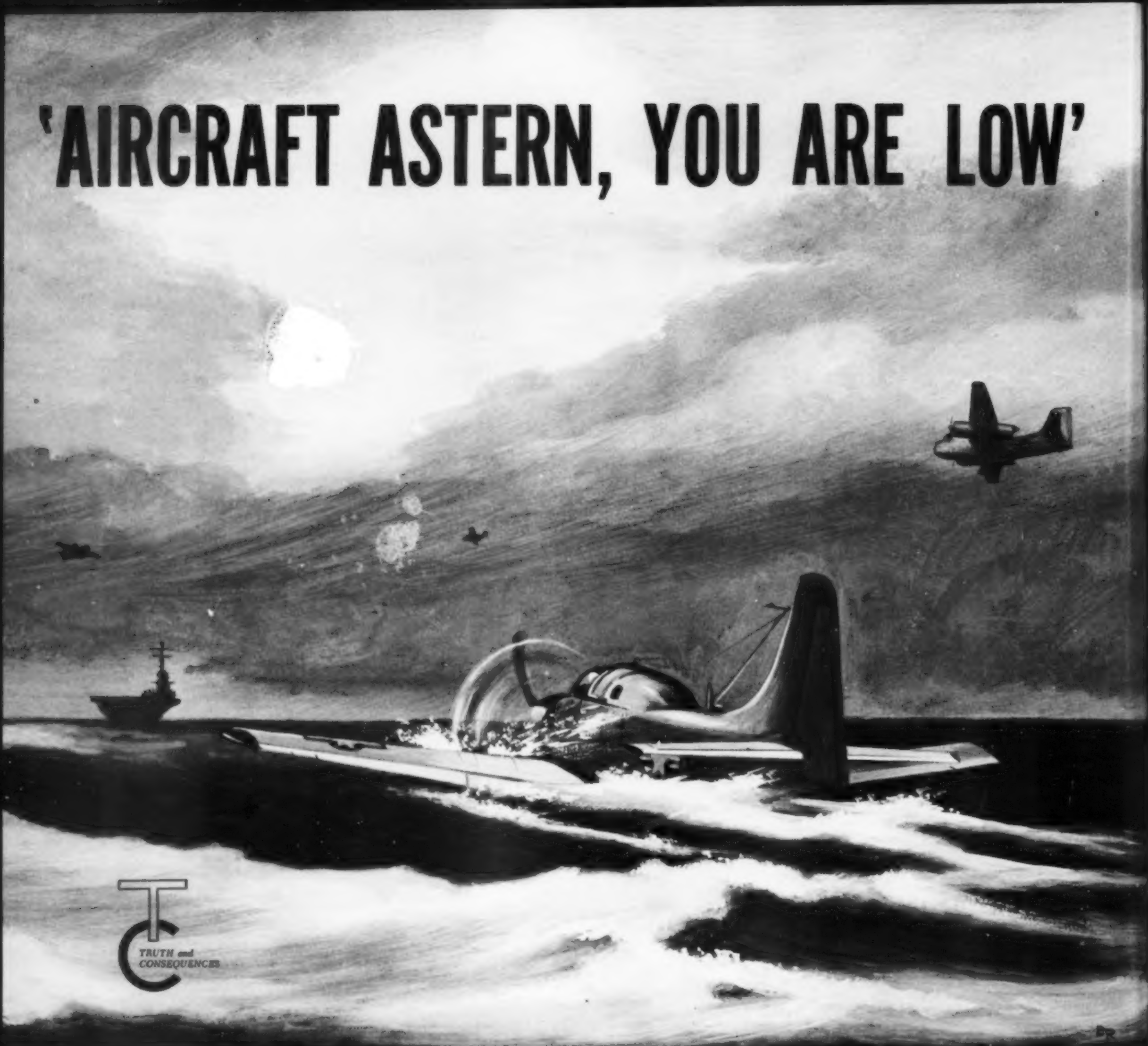
In 1930, the first year aviation safety figures were kept, more than 28 passengers were killed for every 100,000 passengers miles flown by scheduled air lines. Thirty-three years later this figure has dropped to less than one passenger killed for every 100,000,000 passenger miles. This is a distance equal to some 4,000 trips around the world.

Practicing safety does not compel a person to live a drab, uninteresting life. Courageous adventurers are great believers in safety. Explorers, aviators, and daredevil race drivers make careful preparations and take every precaution to make their undertakings as safe as possible. They are living examples of how carefulness makes great adventure possible.

Everyone who wishes to live a successful and colorful life must take adequate precautions so that his adventures will not be cut short by accidents.

5th AF Safety News

'AIRCRAFT ASTERN, YOU ARE LOW'



I was surprised to feel a thud and notice water spraying by the canopy.

I was scheduled to participate in a night deck lighting evaluation. The plans called for me to make nine night carrier landings under various deck lighting configurations. Only deck edge lighting and mast lighting were being evaluated, so the centerline lights, threshold lights, meat ball and datum lights were to remain on throughout the evaluation.

I took off alone in an EA-1E after a thorough preflight at approximately 2300. The weather was clear; however, it appeared to be exceptionally dark since the moon had set and there was a ground haze which limited visibility and blurred lights. It was necessary to rely heavily on the instruments during the flight to the ship.

Arriving overhead at 2325, I was cleared into the Delta pattern at 1000 feet. About the third orbit I was cleared over the ship to break at 1000 feet to be followed by a flight of three S-2E aircraft which had been assigned Delta at 1500 feet. It was puzzling to see that the S-2E aircraft were flying below me, so I checked both my pressure altimeter and my radar altimeter, both read 1000 feet. By the time I had reached over-

head, two of the three S-2E aircraft were below and ahead of me, heading in the direction of the break. Land/launch told me to follow these aircraft into the break. A 360-degree turn placed me aft of the third S-2E, following upwind. Shortly the tower called and told me I had drifted to the right upwind causing me to double check my heading which was exactly the foxtrot corpen given by the ship. I was still directly behind the third *Stoof*.

Cleared downwind in turn, gear and flaps were lowered completing the landing checklist. At 95 knots, 600 feet in a landing configuration, I began to feel wide abeam but I still appeared to be directly behind number three S-2E. As my interval aircraft passed my port wing on final I began a turn off the 180 noticing a two nautical mile DME reading on my tacan, 95 knots, 600 feet. Proceeding around the turn I began to wonder why I could not see any centerline lights on the ship. I could see green datum lights in the distance and noticing the *Stoof* make a trap, I decided to use the direction he passed the datum lights as a guide for line up until I could see the line up lights for myself. Just about completing my inbound turn, still seeing no line up lights, I was surprised to feel a thud and notice water spraying by the canopy and into the cockpit. More bounces quickly followed until finally the aircraft came to rest with the water level slowly rising. I do not believe the aircraft ever bounced completely clear of the water once contact was made since there was constant spraying of water by the canopy.

As soon as the aircraft became still I unplugged the radio cords, loosened the safety belt and turned to exit. I stepped onto the wing. It was sinking, so I jumped into the water still wearing the parachute. Pulling one inflation cord on my mae-west, it inflated and kept me buoyant. I experienced some difficulty in dislodging the raft until I followed the lanyard from my mae-west. The raft slid out of its case with ease.

As the raft inflated, I glanced back at the aircraft. It was sinking with the leading edge of the wing and the nose being the last portions to go. The near wing, fuselage and tail sections appeared to be intact. With the sighting of no debris, I would conclude that the aircraft went into the water wings-level in a very gradual descent.

After connecting the parachute to the now inflated raft, climbing aboard presented no problem. I noticed aircraft were circling closer so I turned on my mae-west light and aimed my flashlight in their direction. As an S-2E approached nearly overhead I ignited a night flare from my mae-west. He apparently saw it and began orbiting. Others arrived making search light passes and finally dropped a floating flare. I noticed a destroyer approaching and was picked up by her motor-whaleboat and taken aboard.

Comments

The flight was conducted under an advisory control of USS __________CATCC. This meant that aircraft were cleared to turn downwind by CATCC, the pilot was to report abeam and then CATCC was to instruct the pilot when to turn inbound. Aircraft separation and carrier location had to be accomplished visually. However, the interval was so great that visual reference with other aircraft and the carrier was impossible. Therefore a combination *IFR and VFR flight was required.*

During descent to the water, the LSO states he saw an aircraft in a low 90-degree position. The LSO transmitted, "aircraft astern, you are low"; however, the pilot never heard the transmission.

The pilot of the S-2E in the search stated he dropped the marine marker on the downed pilot's mae west light.

Conclusions

The board has established that the primary cause of the accident was the pilot's inattention to his flight instruments.

The pilot's attention was diverted from his instrument scan while attempting to locate the centerline lights and this has been established as being a contributing factor in the cause of the accident.

The open canopy is suspected of having prevented the pilot from hearing the radio transmissions, "turn inbound," and "aircraft astern, you are low."

Recommendations

- It is recommended that the necessity of monitoring the flight instruments on all carrier approaches be reemphasized to all pilots.
- It is recommended that night carrier operations be under positive radar control during marginal weather conditions and on nights with no defined horizon.
- It is recommended that SAR aircraft use care when dropping marine markers in the vicinity of survivors in the water.

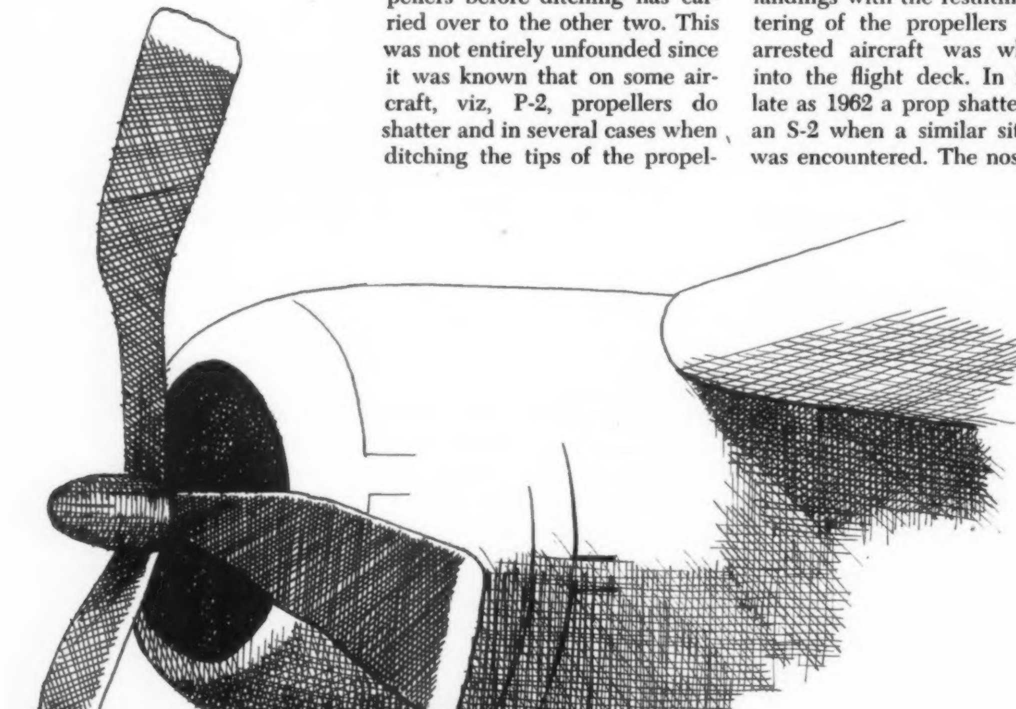
A NEW TWIST

or blades versus shrapnel, a review of power-on di

For years the fear of propellers shattering and becoming shrapnel, combined with close proximity of the propellers to the crew space in the S-2, has led to the doctrine calling for feathering the propellers in the S-2 before ditching.

Due to the marked similarity of the C-1 and E-1 to the S-2, the doctrine of feathering the propellers before ditching has carried over to the other two. This was not entirely unfounded since it was known that on some aircraft, viz, P-2, propellers do shatter and in several cases when ditching the tips of the propellers have come off and have entered the fuselage. It should be noted, however, that there is a marked difference in the construction of the blade of the P-2 which is ribbed and hollow, and the forged aluminum blade now found on the S-2.

Some of the "old timers" relate instances of S-2's that sheared their main gear on hard carrier landings with the resulting shattering of the propellers as the arrested aircraft was whipped into the flight deck. In fact as late as 1962 a prop shattered on an S-2 when a similar situation was encountered. The nose gear



By LT S.A. Fink

ditching effects on the props of S-2, C-1, and E-1 aircraft.

was stuck up with the main gear down when the aircraft was landed on a field and engaged the field arresting gear. The aircraft nose pitched down on arrestment and the starboard prop, still turning, shattered when it struck the concrete. This recent occurence proved to be an exception to the rule. Grumman advises that approximately five years ago the props on the subject aircraft were changed to a softer, peened aluminum alloy, and now considers the subject of shattering propellers a dead issue.

A review of the current S-2 ditching procedures reveals the doctrine *has* been changed and that the fear of the shattering propellers has either been repressed or supressed by the greater fear of making a compressed splash. Hearing somewhere that it was unhealthy to have repressed fears since they tend to disturb sleep and cause dreams about inkblots, I felt a compulsion to root out the apparent lingering fear of making a power-on ditching. As somebody once said, "We have nothing to fear but fear of shattering propellers!" . . . . or something like that.

What happens to those whirling propellers when they hit water? A study of all multi-engine ditchings since 1 July 1958 revealed eight cases of S-2 model ditchings — all eight had windmilling props or power on — *none were feathered.* Of these eight, only three aircraft were recovered. In one case, double engine failure on an approach to landing resulted in ditching in shallow water with both propellers windmilling. Another case resulted from an uncontrollable propeller. The pilot made a successful ditching with one propeller windmilling and power on the other engine. (see "Painless" APPROACH, August 1960). The third case occurred when a pilot and copilot working at cross purposes ditched an S-2 with power on both engines.

The three cases show that with reduced power the propeller blades will bend aft in a gentle arc, and with power on the propeller blades will twist to a feathered angle and bend counter to the direction of rotation about halfway up the blade. With high torque on, the propeller as a unit may separate from the engine at the propeller shaft. It *appears* that after separating from the engine the propeller spins off to the right. Shrapnel from a blade on the other hand will *normally* go to the left.

There was one case (an unrecovered aircraft) which commenced with a starboard engine failure after a night catapult shot. Not being able to feather the propeller the aircraft was ditched with full power on the port engine. The pilot's side window shattered after ditching which could possibly have been caused by the port propeller separating from the engine; however, this is pure conjecture.

As the evidence was not altogether conclusive — I hopefully sought more information on the behavior of turning propellers of the type employed by the S-2, C-1, and E-1 aircraft when encountering elements of denser substance. What would be more dense than an inadvertent wheels-up landing or a premature retraction of landing gear on takeoff?

Four unintentional gear up landings of S-2 and E-1 model aircraft with windmilling propellers or low power setting yielded the neatest prop tip curls. The test case, premature retraction of the gear with takeoff power on both engines, was especially rewarding. Following a normal takeoff run, power set at 2800 rpm/55" map, 60 kts, the landing gear retracted and the C-1 settled on the runway. The blades of the propellers bent very similarly to the case of high power ditching with the port propeller coming off at the propeller shaft. In none of these cases did the propeller enter the fuselage, neither in the ditchings nor in the ground landings.

The techniques for ditching have been adequately covered by excellent publications such

Inadvertent gear up landings are proof of the pudding that the blades normally won't shatter. BELOW: Even in the case of a gear collapse during a high power turnup, blade structural integrity was retained.

as OpNavInst 3730.4, *Aircraft Emergency Procedures Over Water*, and APPROACH (August 1960). The technique was also discussed in the January 1964 "*Waveoff*," the Canadian counterpart of APPROACH magazine, in the letters to the editor. While the policy there is apparently still pilot's choice, the thoughts of one contributor are most appropriate.

"The successful ditching of an aircraft is predicated upon maximum control right up to the moment of impact. The pilot, if able to anticipate the ditching emergency, sets up his airplane in power, airspeed, attitude, flap configuration, and above all – rate of descent, and maintains the status quo right up until touchdown. Any attempt to flare at the last moment easily leads to disaster. . . In the face of these accepted principles . . . to have the pilot feather both just prior to touchdown, negates all the careful planning, and reduces the degree of positive control just at the critical moment. Considering the large change in trim and rate of descent that will immediately result, the pilot would be faced with an unnecessary control problem that would most certainly prejudice his final efforts.

"Aside from all this, what about the night situation? Power here is an absolute must.

"The rotating propellers would have no detrimental effect on the airplane's water landing characteristics and the amount of power carried would probably not cause blade shrapnel. Shrapnel, if indeed any were present, would be absorbed by the water."

In conclusion, the forged aluminum propeller now used on the S-2, C-1 and E-1 has not shattered when contacting water and generally will not on the runway; however, with high power on, the propeller may separate from the engine at the propeller shaft and spin off. The side movement of the propeller after coming off is not fully established, but it has apparently not penetrated the fuselage. With these thoughts in mind, VAW-12 has submitted a change to E-1 NATOPS calling for power-on in emergency ditchings.

It is hoped that this will allay the fear of shattering propellers while ditching these aircraft; and when it becomes apparent that a flight is coming to a premature conclusion out of range of the niceties of a prepared runway or flight deck *available power will be used*. Using power in these planes while ditching won't cause the propellers to shatter . . . but it will give blades a new twist.

LT S. A. Fink, a graduate of Wayne State University class of 1955 entered the Navy in the AOC program. After completion of flight training in February 1957 he was assigned duties as flight instructor in the Basic Training Command. A tour of overseas duty at NAF West Malling, England followed, and then an assignment to VAW-12. The last five months at VAW-12 were as ASO for the squadron where this article was developed. Currently assigned to NAS Norfolk, Operations Department with collateral duty as administrator of the new Aviators Instrument Ground School at NAS Norfolk.

A CLOSE SAVE

A housewife settles down for a second cup of coffee after getting the kids off to school – a storekeeper is getting ready to open for business – traffic on the city streets is a little slow due to the light rain and fog – in general a normal winter morning for thousands of people in south Texas.

However, at 38,000 feet above the rain, fog, hustle and bustle of San Antonio and Austin a young Navy pilot is experiencing a not so normal morning. What started as a normal instrument training flight suddenly became a nightmare when the generator of the airplane failed. The airplane had a battery that can last as long as 20 minutes with conservative use. However, the battery does not last very long when all of the radios and instruments are required to maintain flight. This was such a flight.

The tops of the overcast were at about 37,000 feet. At 22,000 feet where he was flying, the clouds were just as thick, if not thicker, as the fog on the ground. The pilot radioed that he had experienced a generator failure and asked for a field that he could go to, but he received no reply. His battery no longer supplied the necessary power to his radios for an answer. With little fuel and no place to go he started climbing to get on top of the overcast and using the last bit of power from the battery he turned on the emergency "Squawk" of the SIF. He completed the last portion of his climb to VFR on-top using only the aircraft turn and bank indicator and standby compass.

Meanwhile, controllers on the ground heard the pilot broadcast his generator failure and tried to tell him the nearest VFR field. Word was also passed to the Air Traffic Control Center that the airplane had lost its generator and was at 22,000 feet.

The center was receiving a mayday squawk on their radar and even after the battery went dead they were still able to keep track of the airplane on radar.

While this was going on, a flight of two aircraft from homefield were in the same area on another training flight. The leader received a call from the center advising them that their approach time had been extended by 30 minutes, because of the lost bird. They also said that they thought a radar target northwest of their position was the lost plane and requested he investigate if he had enough fuel. The pilot said that he would and proceeded to climb his flight on top of the overcast. When they were about 28 miles from the suspected aircraft the wingman saw the contrails and an interception was completed. Through hand signals the leader determined that the ailing plane had less than 15 minutes of fuel remaining. He was advised of the closest field suitable for a landing but the weather there was 500 feet overcast and 1 mile visibility in light rain showers.

The leader asked for and received a radar vector to the field. Center switched radar controls to approach control during the descent and then again to GCA for landing. Although the radar was set for landing on runway 35 a downwind landing was requested and received to save fuel. According to the best estimates, the plane with no electrical power only had 2 minutes of fuel left. After breaking out under the overcast the ailing bird landed while the original flight of two took a missed approach and made another GCA.

The total time? That housewife just poured her third cup of coffee and the stores just opened.

Several well dones are in order on this save. First, LT Van DeMark (VT-24) for his skill in flying the aircraft with only a turn-and-bank indicator and standby compass while climbing to the contrail level. Second, the controllers at San Antonio center. Third, Austin approach control and Bergstrom AFB GCA for flexibility during the emergency. And last but not least, CAPT Jack Bond USMC (VT-25) for quick thinking and outstanding judgment.

your signal DIVERT

I was flying a normal F-4 CAP hop in WestPac, weather conditions were ideal throughout the area and the hop was normal until we returned to the ship.

I was following an F-8C and as I rolled in at the top of the slope he was approaching the ramp. When he landed I noticed he came to rest in a wing down condition. The LSO called "Foul deck, clean up and conserve." At this time I had 2900 pounds and cleaned up as instructed. As I approached the ship the tower told me my signal was divert, to "clean up, hook up, and contact strike control passing 2500 ft."

They gave me a bearing to the east and a distance of 180 miles. As I turned to the heading I asked the tower to confirm 180 miles as I felt, without consulting my bingo card, that I didn't have enough fuel. They came back with a distance of 168 miles and at this time I was committed, after accelerating and climbing through 10,000 ft.

During the climbout my RIO double checked the bingo card and confirmed my thoughts fuel wise, this one would be close. I tuned in Cubi tacan. It locked up at 120 miles and we had 1300-1500 pounds of fuel. I leveled at 36,000 feet and set max range mach number. About this time strike control called and asked if we had jettisoned our center line tank, which I had forgotten. I immediately hit the external stores emergency jettison switch and the tank left the aircraft.

As we approached 60 miles out with 800 pounds, things looked a little hairy so I came up on guard channel and informed the world. Everybody replied except Cubi Tower. I was squawking 3-77 and emergency. Clark Approach Control had us in radar contact and we had communications with them so I told them my situation.

We had started our idle descent at this time and were 40 miles out with 600 pounds. My RIO and I went over the entire ejection sequence and stowed all loose gear. I felt pretty confident that if we had to leave, at least someone would know where to look. About 20 miles out I saw that our let down from altitude was a little premature or we had head winds because I was going to have to drive straight and level for about 10 miles.

We only used 200 pounds in the idle descent and made a straight in approach. I had 400 pounds at about a mile and the landing was uneventful.

We had the aircraft refueled and the fuel truck counter said we took on 2024 gallons. Natops says the aircraft holds 2019 fully serviced.

I feel that people who run the show on a carrier use bingo fields as a crutch anytime things get close during the landing evolution. The F-8 in front of me sheared a port main mount but the flight deck crew had him out of the landing area in 7 minutes. This was a short delay and I could have been calling the meat ball again with not less than 2000 pounds. We had an A-4 tanker overhead but because he was on a long cycle he didn't have fuel to give.

In my estimation "bingo" is an emergency in itself and should not be used except for carquals and in some situations at night.

ANYMOUSE

The purpose of Anymouse (anonymous) Reports is to help prevent or overcome dangerous situations. They are submitted by Naval and Marine Corps aviation personnel who have had hazardous or unsafe aviation experiences. As the name indicates these reports need not be signed. Forms for writing Anymouse Reports and mailing envelopes are available in readyrooms and line shacks. All reports are considered for appropriate action.

— REPORT AN INCIDENT, PREVENT AN ACCIDENT —

You are low state to begin with and any other difficulties encountered on the way to the beach could compound the situation into the loss of an aircraft.

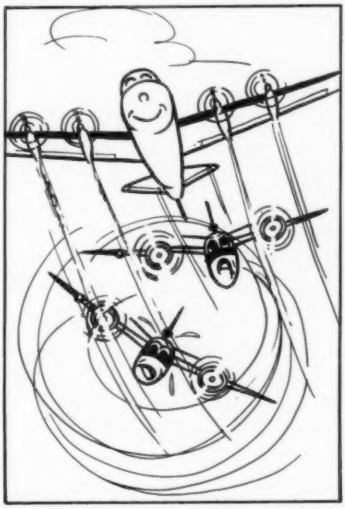
If bingo fields have to be used, then the officers with the responsibility of giving the order to go must make every effort to have accurate information on distances and fuel required.

T-56 Turbulence

At an east coast air station, two S-2s launched early on a CAVU day for mini-bomb practice, aircrew training, and formation training. After the uneventful flight, the two S-2s rendezvoused about 15 miles southeast of the airfield and headed home at 1500 feet. At 12 miles, a gradual letdown was initiated to 1000 feet. About midway through the letdown, a P-3 was observed about two to three miles ahead maneuvering in steep banks and rapid turns at about 500 feet. The next time the P-3 was seen, he was passing under the formation. He pulled up immediately in front of number 2. Those Mississippi riverboat paddles on the front end of Mr. Allison's T-56s leave a wake that is no place to be flying a pair of *Stoofs* in formation. The number 2 plane's nose pitched up about 15 degrees and the left wing dropped about 30 degrees. The pilot closed the throttles, applied full right aileron and rudder and full down elevator. He missed the leader's rudder by the length of a flight deck director's taxi wand.

After landing and drying out the S-2 cockpits, the pilots contacted the A-13 solo who piloted the P-3. This very "experienced" pilot stated that he had joined the formation in right echelon and attempted to contact the flight leader on tower frequency. When it appeared that the *Stoofs*, already cleared to the break by the tower, were on a tactical frequency, he decided to break off by adding power and flying under the formation.

OpNav 3710.7A says you shouldn't oughta do things like that. The *Stoof* drivers say, "#$%$–&'( )#$)!!!" And insurance companies will continue to say, "$10 a month extra," as long as we have bi-wing barnstormers flying multi-million dollar high performance aircraft.



Determination

At one point during the cruise, I began having some difficulty in smoothly accomplishing my after arrestment checklist. On one particular flight, I was determined that everything would go smoothly and to that end reviewed and practiced very carefully the after arrestment sequence. While in the groove I once again reviewed my procedure as a double check. Then came the landing, arrestment, roll back, and hookup signal. The next thing I knew, I was sitting there with my hand on the wheel handle. No pull – no sorrow. But close?

Grounded Means Grounded

An unidentified contact was passed from the prosecuting CVS to our CVS in the north Atlantic. A two-day flight schedule was rushed through the HS squadron. All crews were scheduled for one hop every 19 hours, in order to simplify the schedule.

At 1400 on the day concerned, nine pilots and four crewmen received flu shots and were grounded for 24 hours. At 0100 that night, 11 hours, later, a flight of three helos was launched. Of the six pilots and three crewmen who were launched, three pilots and two crewmen had received the shots and were grounded. The word was passed, however, that unless you were really sick, go ahead and fly.

Luckily the launch returned safely. Several of the "grounded" pilots stated they had felt weak, slightly feverish, and had headaches, as is usually the case after flu shots are received. This particular launch was also short on sleep due to the rush job of scheduling. Combining this with the flu shots turned the flight into a potential disaster for the sake of expediency.

It is recommended that in future instances of this type, squadron commanders take shot groundings seriously and schedule crews accordingly. It is also recommended that sick bay refrain from giving shots during an operating period.

Unlike the flight control systems on present day high performance aircraft—the Naval Aviation Safety Center desires a continued feedback.

Has information in any Safety Center publication ever helped you to prevent an accident, avert an injury, or deal with an emergency in a better way?

If so, and you have not already informed the Safety Center, it is particularly desired and important that you do so. Such feedback is vital to all departments at the Center and for fiscal support of our safety research and education program.

Low Altitude Hooded Flight

Dear Headmouse:

Are there recommendations as to the minimum altitude for donning an instrument hood (visor-type) in single-piloted aircraft?

CDR NALL,
CNAVANTRA STAFF
NAS CORPUS CHRISTI, TEXAS

► Good question. The September 1957 APPROACH published the narrative of a midair in which a distraction due to a change to squadron common radio frequency was involved. Operating procedure was altered such that a switch to squadron frequency could not be made until reaching a position of 5000 feet AGL and 10 miles distance from the field.

OpNavNote 3722.1 of 8 April 1960 (cancelled for record purposes 4-9-61) directed that there would be no radio frequency changes below 2500 feet AGL. Although neither of these apply directly, it appears that limits established by the OpNavNote apply equally as well for the question at hand.

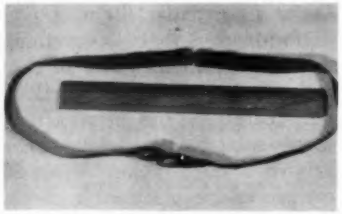
Very resp'y,

Headmouse

HS-4 Flashlight Strap

Dear Headmouse:

In reference to your March answer on helo pilots' flashlights, HS-4 has also been concerned with this problem. In order that the flashlight be readily available in the event of loss of cockpit lights, yet not so rigidly attached so as to be a hazard should it become entangled, our pilots wear it around the neck on a specially-rigged strap which seems quite effective. (See photo.)



The strap is ⅜" webbing held together with two wire spring clamp type fasteners rigged so as to be at an angle when the strap is stretched. One fastener works fine but two are used for safety should one foul. The fasteners pull apart with approximately 20 pounds of pull, depending on the angle at which they are fastened. This is felt to be strong enough so as not to break prematurely during an emergency exit.

ROBERT M. DORSEY, LTJG
HS-4 PIO

Flight Gloves

Dear Headmouse:

Many of the pilots in our outfit have started turning their standard issue cream color flight gloves inside out and wearing them in this manner. They claim that the smooth outer leather (now inside) will not absorb as much perspiration and that they are more comfortable. Also, that the rough outer surface (was inner) does not become slick and slippery when wet with oil, hydraulic fluid, etc., encountered in a thorough preflight. The fact that the rough surface (now outside) picks up oil much more readily and, therefore, is a greater hazard in the event of fire does not concern them. This procedure is becoming very widespread in our area and I was wondering what the Safety Center's views are on this matter.

SMELLY HANDS MOUSE

Have you a question? Send it to Headmouse, U. S. Naval Aviation Safety Center, Norfolk 11, Virginia. He'll do his best to help.

► Turning the cream color gloves inside out may result in the rough surface picking up oil and grease, creating a fire hazard. Clammy gloves worn right side out sounds like the lesser of two evils. How many FURs have you put in on these gloves?

Very resp'y,

Headmouse

Interference?

Dear Headmouse:

The fleet commander sent a message asking for additional info on our helo accident. Is this jumping the gun on an accident board, or is it interference? Why wasn't NASC an adee?

ROTOR MOUSE

► The answer to your first two questions is negative—no problem or interference created. In fact, you should be glad they care, and are fully investigating. In this case, they may have had access to info which you didn't. As for cutting NASC in, or not, that is their prerogative. However, we can only help if we know what is going on, and in most cases it appears to have been an oversight.

Very resp'y,

Headmouse

Steel-Toed Safety Shoes

In the March, 1964 APPROACH, Headmouse promised to pass along the official word from CNO on steel-toed safety shoes as soon as it was received. A letter to NASC from CNO advises ". . . there appears to be no question that flight and hangar deck areas aboard aircraft carriers should be designated as foot and toe hazardous areas and that appropriate safety footwear should be required to be worn by personnel working in such areas. The designation of foot and toe hazardous areas, however, is a command responsibility. Commanding officers periodically should review work operations, work areas, and accident records to determine if certain operations and areas should be declared hazardous from the viewpoint of requiring foot and toe protection. . ."

As requested by CNO, commanding officers of all aircraft carriers are being advised by NASC letter to designate such areas as foot and toe hazardous "for the purpose of requiring the wearing of appropriate protective footwear by personnel assigned to such areas."

FOD Info

Dear Headmouse:

Request a copy of the pamphlet "Aircraft Gas Turbine Foreign Object Damage Protection" and any other literature covering this subject.

Does the Aviation Safety Center consider the use of the magnetic sweeper an important tool in the FOD program or is it felt that the new vacuum type sweepers are adequate by themselves?

D. S. JUDD, LCDR
SAFETY OFFICER, NAS DALLAS

► The pamphlet mentioned is no longer in print and copies are not available. APPROACH Cumulative Indexes July 55-June 62 and July 62-June 63 provide a consolidated listing of APPROACH articles on the subject. In addition, the Safety Center distributed an audio-visual tape-slide presentation during 1963 to all air stations. Much insight can be gained concerning FOD prevention by reviewing this material. The vacuum cleaner cited in BuWeps Inst 11200.2 of 30 Jan 62 obviates the use of the magnetic sweeper in that it will pick up all potential FOD objects in addition to ferrous metal objects. Biggest FOD source is still mech-induced.

Very resp'y

Headmouse

"What did the old man have to say about your wheels-up landing?"

no warning

During an ASW exercise an S-2 crashed. Here is the pilot's survival narrative. . .

From wing drop to impact with the water was about four or five seconds. I tried to land the S-2 in a flat attitude or even regain flight up to the time of impact, but as there was no control at all, I just had to sit it out. No warning was given to anyone aboard. The aircraft shuddered just before it struck the water nose low, left wing down.

At impact, my shoulder harness was slightly loose for maneuvering during MAD operations . . . inertia reel locked . . . chin strap on my APH-5 helmet loose . . . flight gloves off. All other flight equipment was normally deployed.

Impact was violent . . . a rush of warm green water, violent motion and frequent collisions with many small objects. Throughout the whole

episode I was completely conscious and kept my eyes open. I was thrust forward and carried through the water for four or five seconds before coming to a halt. I was minus, among other things, hard hat and seat, and was entwined in some dark-colored webbing which must have been my shoulder harness and seat belt. Light above me indicated I was near the surface. After about 10 seconds of orientation and endeavor I freed myself from all entanglements by lifting the webbing over my head. I started for the surface and at the same time tried to locate a CO_2 toggle on my life vest which was hanging loosely about my neck. I pulled the toggle in hopes that vest buoyancy would enable me to reach the surface more quickly. The CO_2 cartridge fired but no inflation resulted. Just as I reached the water surface, I pulled the second toggle and the vest inflated.

While getting the first few breaths, I moved every limb to determine if I was injured. I felt no pain. I saw debris everywhere in the water and took a head count of all hands. . . Floating around us were sonobuoys, a navbag, parachutes, a large four-man raft, two hard hats and numerous assorted odds and ends.

As the crewmen were doing well (*the copilot was missing and continued so.—Ed.*), I attempted to swim to the large raft. However, it was blown away faster than I could swim to it. Realizing this, I swam to a floating parachute knowing there should be a raft attached to the seat. No raft.

During this time the mae west was doing little to keep me afloat. I then started blowing into the oral inflation tube. About half-way through, I felt uncommonly weak, but one of the crewmen arrived and finished the job for me. The life vest had parted in some way so that it was very loose around my neck. I pulled through the opening so that the life jacket was resting beneath my armpits like an inner tube. I saw blood in the water and, feeling my head, realized that I was bleeding. I wasn't too concerned for I felt no pain. (*The pilot had sustained a severe scalp wound in the back of his head.—Ed.*) During this time PDC's were exploding with no harm to our personnel in the water. The crewman stayed with me and helped keep me afloat.

Immediately after I discovered my head wound, I saw the destroyer about 50 yards behind us with a small motor whaleboat on the way. Our total time in the water before rescue was five to eight minutes.

• • • •

The pilot's APH-5 helmet came off at impact. He states that he intentionally wore his chinstrap loose because it was uncomfortable when tightened. His helmet would have protected him against head injury had it stayed on. The two crewmen had loose chinstraps and lost their SPH-1 helmets.

All Pilots Read

SAFETY

Safety is by no means an
Accident. It depends upon many
Factors, among which must be;
Experience, knowledge, thoroughness,
Teamwork, and the most vital of all,
Your own professional attitude.

NARTU Norfolk

Cross-Monitor Takeoff and Approach

The author of this item was an airline captain with many thousands of hours in the cockpit. His words are worth repeating . . . as a constant reminder of the distractions that can lead to accidents if we are not alert to them.

Many accidents can be laid to a series of coincidental failures, any one of which when taken alone would not be critical. These are apt to occur during the most critical part of the flight — takeoff, for example, when one pilot should be doing the flying and the other one should be cross-checking the instruments as well as visually checking outside for other aircraft.

Too often the non-flying pilot becomes so occupied with his non-flying duties he neglects to do either of these, thus the takeoff becomes a solo or single-pilot operation.

Great stress must be placed upon requiring the non-flying pilot to always check the climbout procedure to at least an altitude of 500 feet, by referring to the instruments and, when possible, by visual reference as well. This is done consistently on approaches to landings, and it should be consistent on takeoffs. Nothing must distract the non-flying pilot from this important responsibility.

—Flight Safety Foundation

Weather Forecasting by Unattended Telemetry System

Weather forecasts in the United Kingdom will be based on more complete data and should therefore become more accurate, if an experiment soon to be undertaken by the Meterological Office proves successful.

It is proposed to develop a system of automatic weather stations to fill gaps in the observing network throughout the British Isles. Initially, the Meteorological Office has placed a contract with EMI Electronics Ltd. to supply one experimental unattended telemetry system to transmit data between two points over the GPO telephone system.

This will be the first automatic weather monitoring system to be installed in this country, and is claimed to be the most advanced of its type in the world. It samples more information channels more accurately than comparable systems in France and the United States.

The first set of equipment will be used by the Meteorological Office to determine how best to apply the technique of telemetry to the automatic monitoring of weather information at a range of widely dispersed locations.

Data concerning pressure, temperature, humidity, total rainfall, sunshine, wind speed, wind direction and rate of rainfall at any given moment can be sensed by transducers and transmitted from the remote station to a central forecasting office, many miles away.

Entirely unattended, the telemetry transmitter will be silent and will not consume any power until interrogated from the central location. It will then transmit the meteorological data in analogue form to the receiver, where the information will be shown on meters or digital display devices. These will retain the readings until manually erased. Provision will also be made for attaching a paper tape punch or tabulating machine to preserve the data for subsequent reference. Overall accuracy of the EMI system will be better than ± 1 percent.

DME Unlock

It is possible under certain conditions for the DME to become "blocked" on certain ground facilities which have been poorly sited or have certain older type antennas.

This "blocking" will cause the DME to "unlock" which will manifest itself inbound about 15 miles from the station, at which time the DME starts to "search" as though signal has been lost. The DME may not "re-aquire" and again present useable distance information until the aircraft is about 15 miles beyond or from the station.

Facilities which are known to cause this condition are: Findlay, Ohio; Colts Neck, N. J.; Olympia, Wash., and Los Angeles, Calif.

In the case of Los Angeles, this problem is worse when approaching the mainland from over water.

Some relief can be had by momentarily channeling the DME set to another frequency and returning to the desired channel. If the aircraft has moved through the bad signal zone, "lock-on" will be obtained without the necessity of waiting for the equipment to "unblock" itself.

We have had no flight reports which would confirm that DAL has encountered the condition described. If this condition should occur please advise the Assistant Director — Communications — ATL giving altitude, distance from VOR/DME facility, bearing from facility and type aircraft.

—*"Up Front" Delta Airlines*

Punitive Measures

At the recent Air Line Dispatchers Association's annual meeting, held this year in Dallas, Texas, FSF's Director, Jerome Lederer, participated as moderator of a discussion of punitive measures. Prefacing his presentation of case histories of airmen who had reported incidents and subsequently been penalized, Mr. Lederer stated:

"Discipline is needed in the operation of aircraft and airways, and enforcement of regulations is one way to get it. However, except in case of willful misconduct, extreme carelessness, etc., it is doubtful whether the FAA attains its safety objective by imposing penalties in areas where art and judgment prevail. The FAA says it recognized that there may be mitigating or extenuating circumstances, but this is not the impression that prevails among airmen. The fear that exists as a result of this feeling has dangerous implications.

"Regardless of whether the FAA considers mitigating circumstances," Mr. Lederer added, "safety probably would be enhanced by adopting a system used by the military where airmen are encouraged to admit errors and are guaranteed immunity to prosecution whether an accident occurs or not."

—*FSF Newsletter*.

Short Quote

"An A4C contacted a cable in flight. The flight was a high-low navigation flight enroute to ____________ for weapons training. As far as can be determined the cable was flown into while conducting the low level portion of the flight."

Tall Cables?—Headmouse

The Instructor's Nightmare

Things he hates to think about

During touch and go landings in a T-28 the student made a high and slow approach. Just prior to touchdown he closed the throttle and rotated the nose sufficiently to stall the aircraft approximately 15 feet above the runway. WHAM BAM!

Damage: port center wing section overstressed . . . port flap wrinkled . . . port fuselage wrinkled . . . starboard wing wrinkled at main landing gear attachment point . . . pulled rivets and screws underside of both wings. . .

Hypoxia Suspected

How many have been caught in the deadly trap set by the mutual similarities and differences between emergency pressure breathing and oxygen equipment malfunction?

On the homeward leg of a cross-country flight, one of three F-8Cs flew a descending turn into the ground. The pilot did not respond to transmissions from the other pilots in the flight and made no apparent attempt to eject. Events leading up to the tragedy and subsequent investigation point to pilot incapacitation due to hypoxia.

All aircraft were serviced with liquid oxygen from the same cart just prior to being manned. The aircraft in question was serviced last. The man operating the oxygen equipment was reminded that this aircraft was nearly empty of oxygen and to be sure to fill it completely. He later stated that the oxygen system was filled and an even flow of liquid came out the vent. At this time the pressure on the oxygen cart was 18 psi. During servicing, because of the low level of the aircraft system, the pressure was maintained at 20 psi or below. Time spent to service the aircraft was close to a half-hour or more.

After the pilot started the aircraft, he called the oxygen man over and showed him that the oxygen light was on. The service man then cycled and reset the build up and vent valve. He then checked for leaking pressure and found no leak. At that point the pilot indicated an O.K. by thumbs up. The oxygen servicing man went to the cockpit and found the oxygen light out and flow through the pilot's oxygen mask good. The pilot stated everything was O.K. and he was ready to go.

Takeoff was at 2055. The moon was full and the night was exceptionally clear. Climbout was normal and as briefed, including all channel changes and radio check-in procedures. . . After rolling out on heading at about 39,000 feet the No. 2 pilot noticed that No. 3 was still in the left turn, slightly low and descending. No. 2 dropped back and called for No. 3 to check in but did not receive a reply so continued to drop back to join on No. 3. The lead aircraft then called No. 3 but got no answer. No. 3 continued descending after a hard turn back toward the flight path with No. 2 in trail following his lights and attempting a joinup which was impossible even with full military power. No. 2 continued to call for No. 3 to check in. Neither wingman transmitted "eject" on the flight's assigned frequency or on guard channel. No. 2 saw No. 3's lights strike the ground and explode. It was 15 minutes after takeoff. . .

The aircraft had one previous oxygen gripe

Fig. 1

Subject	Rank	Age	Body Build	Hours F8U Flight Time	Total Flight Time
A	Capt	32	Medium	350	2676
B	Capt	29	Heavy	337	1540
C	1/LT	24	Heavy	276	603
D	1/LT	23	Medium	225	544
E	Capt	34	Heavy	663	2395
F	1/LT	24	Medium	258	597

the preceding month. The discrepancy indicated that the red warning light was ON with the system reading 4.9 liters. Corrective action was to free the pressure relief valve which was frozen to the open position and was not permitting pressure buildup in the system. Seven hops were flown in the aircraft with no repeat or new discrepancy on the oxygen system.

The pilot's personal flight equipment incorporated a Miniature Regulator (type 29211-B1) attached to the bottom of a K-4 oxygen hose kit. The week before the accident this regulator was bench tested and determined serviceable. It was returned to the squadron. During these tests, the pressure breathing safety feature engaged at 34,800 feet. All of the pilot's personal equipment was checked at this same time and his oxygen mask was cleaned.

After the accident the oxygen shutoff valve was recovered in the OFF position. Examination of the valve did not indicate that anything had struck the valve on impact and forced it to the OFF position.

Tests of oxygen samples from the servicing trailer and one remaining aircraft in the flight showed no contamination.

After considering the evidence to this point, the accident board concluded: 1. that the pilot turned off his oxygen for an undetermined reason, 2. that he was in control of the aircraft during the level off at 39,000 feet which included setting power and trim for cruise mach, and 3. that he initiated the turn on which the accident occurred.

As part of the accident investigation the Physiological Training Unit was requested to simulate the physiological aspects of the pilot's flight in the low pressure chamber. A precise profile was available as the flight consisted of three aircraft monitored by FAA radar and UHF communications.

Six aviators from the squadron volunteered as subjects for oxygen evaluations. See Fig. 1.

Since it could not be determined whether cockpit pressurization was utilized during this flight, two possible cockpit pressure schedules, i.e. with and without pressurization, were obtained by the AAR board and used in this evaluation. These results are summarized in Figure 4.

During the first phase of this test, it was assumed that cabin pressurization functioned normally and was utilized. Subjects B and E were taken to 16,500 feet in the low pressure chamber, simulating a normal instrument climb to 39,000 feet. To permit the maximum opportunity for hypoxia to occur, the subjects went to altitude without supplemental oxygen. They reached 16,500 feet after 11.5 minutes and remained there another 3.5 minutes for a total flight time of 15 minutes. At the end of this period neither subject experienced any symptoms of hypoxia except some mild cyanosis. These results indicate that the possibility is rather remote for hypoxia to occur with enough severity to incapacitate the pilot within the altitude-time limits evaluated.

Therefore, in the next phase of tests, cabin pressurization was *not* utilized and the subjects

Fig 2.

Subject	Mask Alt.	Removed Time	End Useful Alt.	Consciousness Time	Duration Useful Con. Time
A	Sea level	00:00	32,500	09:02	09:02 Min/Sec
B	10,000	03:00	29,500	08:58	05:58 Min/Sec
C	30,000	08:00	35,800	09:45	01:45 Min/Sec

removed their masks at intermediate altitudes during the simulated instrument climb to 39,000 feet. The results are shown in Figure 2.

The results indicate that if the mask is removed at an intermediate altitude during the climb, the pilot is rendered helpless due to severe hypoxia prior to reaching cruising altitude. In these tests, the end of useful consciousness is defined as the point where the subject becomes totally unresponsive to any commands of the chief observer even when ordered to replace his oxygen mask to prevent becoming unconscious. This point was usually preceded by other symptoms such as dizziness, a "slowing down" of voluntary muscle activity, and in some instances spastic movements of the limbs and head. It was noted that, as the useful time decreased, the endpoint came on with less and less warning. It can be concluded from this phase of the tests that hypoxia becomes highly suspect as the cause of the accident if the following conditions were present: (1) cabin pressurization was not functioning; and (2) the pilot removed his mask and shut off his oxygen supply somewhere above 30,000 feet.

The third phase of the tests assumed that hypoxia was the cause of the accident and an attempt was made to localize the point where mask removal was accomplished. The subjects were ascended all the way to 39,000 feet with 100% oxygen under the same simulated climb conditions without cabin pressurization. The results are shown in Figure 3.

If this is so, the question of why he removed his mask is still left unanswered. During the ascents of subjects D and E, the onset of pressure breathing above 35,000 feet came, not totally unexpected, but nevertheless in such a manner to precipitate momentary confusion probably because *Crusader* pilots rarely experience pressure breathing except in low pressure chambers.

Because of the significance of this phenomenon, Subject F was briefed that he was going to make a simulated flight to 16,500 feet as in the first phase of these tests. During the ascent, all instructions he heard on the intercom supported this belief. In reality, he was taken to 39,000 feet. It was determined later that the subject hadn't the slightest suspicion of this deception. During the ascent, Subject F reported he was having some difficulty with his mask at approximately 15,000 feet (actual altitude: 35,000 feet). He complained he was having trouble exhaling but had no explanation for it.

Upon reaching 16,500 feet (actual altitude 39,000 feet) he requested assistance. He still could provide no other information regarding the problem besides difficulty in exhalation. When it was suggested that he check his inhalation valves he promptly removed his mask and began working on it. He also obeyed the order to shut off his oxygen valve. Within 15 seconds he reported that he was feeling "thick" but continued his inspection of the mask. At the end of 32 seconds, he was completely helpless. He recovered within a few seconds after receiving 100% oxygen and being lowered to 30,000 feet but remembered very little of what happened subsequent to removing his mask. It should be noted that he did not remove his mask nor secure his oxygen until it was suggested that he perform these gestures. The accident pilot and Subject F both had their last low pressure chamber training, including a pressure breathing demonstration during the sum-

Fig. 3

Subject	Mask Removed	End Useful Consciousness	Duration of Useful Con. Time
D	0011:30	0012:30	0001:00 min/sec
E	0011:30	0012:23	0000:53 min/sec
F	0011:30	0012:02	0000:32 min/sec

Average duration useful consciousness time: 00:48 seconds

These results show that the average pilot removing his mask at 39,000 feet becomes completely incapacitated after 48 seconds with a range of 32 to 60 seconds. If it is assumed that the pilot levelled his aircraft at 39,000 feet, still wearing his mask and thus not hypoxic to that point, it can be speculated that approximately 60-90 seconds later he removed his mask and then, 30-60 seconds later he became incapacitated due to hypoxia and his aircraft began to descend.

mer of 1961.

It can be concluded from these tests that:

(1) Severe hypoxia is highly suspected as the primary cause of the accident in question.

(2) In order for hypoxia of this severity to occur, the cockpit altitude must have been approximately 39,000 feet and the pilot not on supplemental oxygen.

(3) One possible reason for not utilizing supplemental oxygen is a malfunctioning of the oxygen equipment, either real or imagined, the latter being a false conclusion based on the onset of pressure breathing at a time when the pilot believed his cockpit altitude 16,500 feet or below.

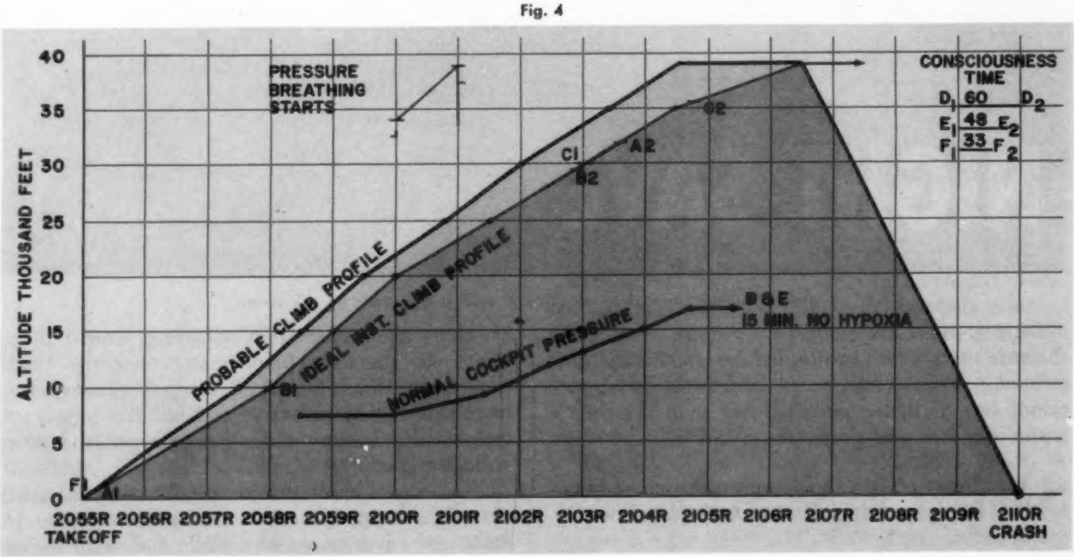
The board concluded that incapacitating hypoxia in such a short time had to be the result of lack of oxygen at a much higher altitude and could only mean a partial or complete lack of cockpit pressurization had occurred. A review of maintenance records of the 20 flights in the preceding 30 days showed no pressurization discrepancies. No evidence was discovered which proved conclusively that an abnormal cockpit pressurization situation did or did not exist. However the board considered a lack of normal cockpit pressurization was a contributing factor.

Cases of this kind demonstrate the necessity for continual training in the dangers of hypoxia and the use of oxygen equipment. According to Naval Aviation Safety Center records, from 1 January 1959 through 30 June 1963 there were 28 suspected or established cases of hypoxia in near or actual aircraft mishaps.

Some pilots tend to remember the "gimmicks" of the severe hypoxia demonstration and forget the *warning symptoms* of hypoxia. Not only does the total useful consciousness time become extremely short at high altitude but the *warning time* approaches zero.

Finally, as the physiologist working on the investigation of this accident points out, pressure breathing due to the evolution of cabin pressurization systems has become an emergency procedure rather than a normal experience for jet aviators. Consequently, the only familiarity the jet pilot has with prolonged pressure breathing can be inside the pressure chamber. The similarities and differences between pressure breathing and oxygen equipment malfunctioning are an important part of a pilot's survival knowledge.

Fig. 4



I loaded a single round into my .38 and fired a tracer aft of the stern.

During night operations a Crusader *went over the side after being positioned for a cat shot. The following story is not concerned with the operational aspects of the accident but with the pilot's water survival and destroyer rescue . . .*

Somewhere—perhaps halfway up the cat—I knew that I wasn't going to stop and that I wasn't going to fly.

In desperation I lit the *Crusader* burner for whatever extra speed it could give me to flatten the trajectory to the water. About this time I heard a voice on tower frequency saying words to the effect of "there's a plane going over the bow." Somehow I didn't feel like I was going fast enough to use the ejection seat so as I left the bow I jettisoned the canopy with the emergency jettison handle and waited . . .

The impact with the water was severe, worse than I had anticipated. It stunned me for an instant and I was aware of a wall of phosphorescent green water rushing over the windscreen. The right-hand fitting on my oxygen mask released on impact but I managed to hold my breath until the

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cockpit came out of the water some unknown time later.

As soon as I regained my senses from the shock, I grasped the ditching handle, pulled hard and scrambled out over the left side of the cockpit. Something was still holding me attached to the airplane although I was so confused I am not sure what it was. I'd guess it was the oxygen and communications line to the console and/or my anti-G suit plug. I started for my knife which I was carrying on the chest strap of the torso harness to the left of the buckle but couldn't get to it immediately in the tangle of oxygen regulator and straps. I believe that I was almost completely out of the cockpit and just below the surface so I shoved against the side of the aircraft with both feet and, realizing I was at last clear, I pulled both toggles of my Mk-3C life preserver. It inflated readily and I was floating upright on the surface and drifting away from the airplane. The wing was about level with the water at this time; I don't know how much longer it floated.

The carrier passed well clear—I was in the water on its port side. My next thought was to let someone know I was OK. I loaded a single round into my .38 and fired a tracer aft of the stern. Then seeing the plane guard destroyer's searchlights, I presumed they had the word. I fired a tracer every minute or so and used a night flare. (*His second night flare failed.*) I had no trouble loading and firing the .38 but thought at the time that it would have been better to have had four rounds already loaded in case one arm was disabled. (*The destroyer skipper stated the tracers were instrumental in guiding them to the pilot. Once in the pilot's vicinity the rescuers homed in on the reflective tape on his helmet.*)

It very soon became apparent that the destroyer was making way toward me so I did not attempt to deploy the raft which was floating along still attached by one rocket jet fitting. (*It's always advisable to deploy the raft no matter how imminent rescue seems.*)

The water temperature was very comfortable and I began to think I would make it. The destroyer was alongside and threw me a line. They pulled me down the side to where a rope net was hanging. I still had the waterlogged chute pack and seat pack attached so they dropped me a stout line with a loop which I got into like a helicopter rescue sling. (*Before any rescue attempt the parachute should be removed whether deployed or still packed because of the danger of the chute popping during the rescue.*) With the help of a couple of men on the rope net, I got up to the weather deck . . . I had been in the water 20 minutes.

• • •

The officers and men of the destroyer are to be commended for their expeditious rescue of the pilot, the AAR states. The ship steered a direct course for the pilot and effected the rescue without mishap. This demonstration of ship handling and general seamanship speaks highly for the state of training of the destroyer crew.

Hull Inspection

AS I went over the end of the angle deck, I felt myself sink rapidly. The deck lights went up. I knew I was real slow so I pulled the curtain. Estimate ejection altitude at 40 feet. The canopy blew and the seat fired. I tumbled through the air and immediately grabbed the D-ring and pulled it. Over my left shoulder I saw the chute start to stream and then blossom.

As I hit the water, the chute dragged me face down. Water in my oxygen mask was gagging me so I pulled the mask off. Couldn't get hold of the rocket jet fittings (was feeling for them too low) so turned over to keep my face out of the water. My gloves were full of water and were hindering my movements so I pulled them off. Still couldn't find my rocket fittings so tried to inflate my Mk-3C but couldn't find the inflation toggles. Tried to get my knife which was attached on the chest strap of my torso harness. More trouble – couldn't get hold of the knife.

About this time the chute had stopped pulling me and I was up against the huge gray hull of the carrier. The chute was all over me. I pushed myself away from the ship – its engines were stopped – and, working loose of the entangling parachute, I

bumped and bobbed the entire length of the hull. Finally I got my rocket jet fittings off — easily, too — and unfastened the seat pan. I thought the chute might be around it. I was taking no chances. Then by feel, I started to free myself from the chute lines. By this time I had pulled the left toggle of the Mk-3C. I completely freed myself of the chute while still alongside the carrier. The chute sank streaming beneath the ship. As I drifted past the fantail, someone on deck above shouted that he saw me. Then I pulled the right toggle of the Mk-3C and turned on the one-cell survival light. They said later the light was easily visible from the carrier several miles away.

My hard hat had floated beside me the entire time — now I retrieved it and waited to be picked up. To help the boat crew find me, I fired two .38 tracers about five minutes apart. Ten minutes later the whaleboat was alongside. A crewman jumped into the water to assist me. I spent the night aboard the destroyer. . .

Just two hours before my accident I had heard a readyroom lecture which had emphasized that ejection was preferable to riding an A-4 into the water.

The investigating flight surgeon has some remarks on training in general: "Every carrier pilot should have the experience of being dropped blindfolded into a pool, wearing an open parachute and all survival equipment and be required to demonstrate adequately his ability to find, deploy and operate all items in his possession — while wearing gloves."

notes from your flight surgeon

Carqual Stress

IN VIEW of the stresses pilots undergo during initial carrier landings, additional types of stress which can be prevented—such as fatigue from long hours and frustration from delays—should not be tolerated. All concerned must combine efforts to prevent this form of stress. Certainly delays cannot be avoided but to leave a pilot strapped in his aircraft for more than 30 minutes seems inexcusable and this happens all too frequently on initial carrier qualifications.

—From an MOR

Corroded Valve

A RECENT case of hypoxia encountered by an F-10 pilot was discussed in a safety council. The cause was found in the pilot's oxygen mask—a corroded, salt-encrusted exhalation valve jammed in the open position. The need for regular and frequent cleaning of oxygen masks must be constantly stressed.*

(**Amen. We'll never know how many of our "undetermined cause" crashes—especially the "straight in from altitude" type—may have had similar problems.—Ed.*)

Semantics

FROM the witnesses' statements and post-crash investigation of the aircraft, the most logical explanation for the accident would be that the pilot was at an altitude some 20,000 feet below his filed altitude with a normally functioning aircraft. The reason for his low altitude was probably a purposeful low level pass close to a relative's house. Any description of the maneuver as other than "flathatting" would be merely a manner of semantics.

—Flight Surgeon in an MOR

Vest Inflation

INFLATING your life vest before exiting a crashed aircraft can hinder your escape. A case in point is that of a plane captain in an O-1C which had hit the water. He decided to swim straight up through the opening where the top canopy had jettisoned but first he inflated his life vest. Result: difficulty passing through the small opening. However, he made it and later was picked up by helicopter.

(*Another reason for not inflating your life vest before exiting a crashed aircraft is increasing the danger of a cut or puncture from wreckage and debris.—Ed.*)

Eye Damage

REVIEW of ground crew personnel first-aid injury reports in three transport squadrons during an eight-month period showed 16 cases of eye injury. Seven of these were due to fluid used in superchargers as a lubricant. Apparently the victims considered they were engaged in *short-time* maintenance procedures and deemed the use of protective devices unnecessary.

Safety Council Action: Squadrons will assure that maintenance supervisors monitor more closely the use of eye protective devices in activities which present eye injury potential.

(*A list of protective goggles can be found in the Safety Equipment Manual, Navexos P-422, 1960 edition.—Ed.*)

MAINTENANCE SYSTEM CHANGES

PHASE II

by CDR A.L. Rasmussen

Here are some of the latest plans for, and changes in the Naval Aircraft Maintenance Program (NAMP). These changes have been directed within the Navy Department and will have a major effect on all those associated with the operation of weapons systems.

Phase II in the modernization of the NAMP is now upon us. Involved are major changes requiring much detailed effort. In some instances, detailed guidelines are lacking at the staff and operating levels. Therefore, this discussion will cover those aspects (insofar as known) needed to tie in all the connecting links and review implementing plans and requirements. Phase I was published October 62.

Personal support and understanding are solicited at all levels in implementing the new systems. Whether bad or good, the new systems will be workable and have a real potential for increasing operational effectiveness and safety in flight operations with less apparent manpower and money. Don't knock it until you read and understand the true "Octane-Number" ("performance rating" for moderately Old-Pros).

Three Levels of Maintenance

Hottest item on the fire is three levels of maintenance directed by the recently published OpNavInst 5400.5C.

Essentially, the "three levels" replace the old six-level system:

A — Overhaul/PAR; B — Special; C — Component Repair; D — Shop; E — Hangar; F — Line. The new levels are: Organizational (old E/F), Intermediate (old D/C), and Depot (old A/B) with some rewrite of functions.

SUMMIT MEETING of Aircraft Maintenance Officers and CPOs, Maintenance Data Collection System Managers, Supply Officers and Automatic Data Processing experts*. Major benefits foreseen in updated maintenance man-hour accounting system is more efficient manpower planning and work distribution, better tooling and equipment utilization, improved budget computations and cost analysis.

One of the more important aspects of the new program concerns the Intermediate level which will be performed by the Air Station Aircraft Maintenance Department (AMD). The AMD officer has been assigned additional duty (ADDU) to the ComFAir or Wing Commander with the sole responsibility for this level of maintenance. The previous D-level people of Fleet units are now assigned in TAD status to the AMD and perform Fleet Intermediate Maintenance. Station aircraft are no longer assigned to the AMD but to a maintenance division under the station operations officer. Therefore, the station AMD now provides the Fleet and Force Commanders with more direct support and improved control of these important Fleet maintenance functions.

*(L to R): LT H. V. Richardson, Fleet Work Study Group; CDR J. W. Beale, ComNavAirLant; W. P. Emery, BuSandA; CDR R. Sampson and H. J. Brackett ATCS, CNAL; CDR R. C. Austin, BuSandA; LT R. H. Hastings, NAS Oceana; J. F. Milliron, NATSF (BuWeps); C. Fleming, BuSandA; A. J. Markum AMCM, CNAL; W. J. Helmuth AKCS, FSS & PAG; CAPT T. B. Haney USAF, FWSG; LT G. P. Dowd, CVW-8; T. R. Gustafson PNC and B. N. Zeitler ADCM, FWSG.

Wiring control panels for Automatic Data Processing (ADP) machine, l to r, are D. C. Mumby, ABH1, CDR Arthur Major, O-in-C, and LTJG W. A. Ferrell (SC) of the Atlantic Fleet Work Study Group.

IBM machine run of aviation maintenance data collection system is reviewed by a panel of experts from a variety of fields: l to r, B. N. Zeitler, ADCM aircraft maintenance; LTJG W. A. Ferrell, data processing; LT H. V. Richardson, aircraft maintenance data collection; J. F. Grady CMSGT USAF 66-1 specialist.

At sea or in a deployed status, the TAD people move with the squadron to support Intermediate Maintenance, either at a new station or aboard ships. Afloat, these personnel work for the air wing or group commander. The "integrated shop" concept is an essential part of the three-level system. Under this system all Intermediate level maintenance personnel are assigned to shops according to their rate. In other words, similar rates are pooled to support a combined shop effort. Thus, greater efficiency should be obtained with this sort of a group effort: combining talent, tools, support equipment and parts.

So far the system appears very workable although some exceptions are required depending on the concentration of like weapons systems, equipment, and manpower. Detachments and advanced base operations also inject cause for negotiations and judgment at the local level. Maintenance at the lowest level is still a requirement.

Project Shortnin'

Lard???!!! No, just the project name applied to the Maintenance Requirement Card (MRC) system.

The MRC program has Navy wide application and is useful to ships as well as weapons systems. The following discussion deals only with the aircraft or weapons system portion.

Actually, the MRC systems, Plan A of OpNavInst 4700.16A, requires a new, more effective method of inspection, data collection and follow-up.

Many of the late model aircraft are already on the MRC system which is basically a revision of the old check sheet system. The following three parts comprise the MRC system:

1. MRC – Maintenance Requirements Cards in lieu of check sheets.

2. Sequence Charts – outline an orderly sequence of inspection.

3. Progressive Maintenance Requirements Manual (PMRM) – a general listing of all inspections including PAR/Overhaul specifications and flight test requirements.

An analysis of cost of the MRC documentation for older aircraft has resulted in a decision to utilize fleet units for preparation of MRCs for selected first-line aircraft. This entails the separation of the Handbook of Inspection Requirements (HIR) into more efficient card system and with a more reasonable sequence. A more workable product will be realized in utilizing practical maintenance units for this preparation with little expense for a great gain. It is believed that the new system with proposed follow-up will eliminate the need to inspect, or will lengthen the inspection cycle for, many weapons systems components. Thus a greater effectivity in the administration of the routine maintenance inspections should result with no reduction in safety factor.

Maintenance Management System

The new maintenance management system is promulgated by OpNavInst 4700.16A and includes most of the foregoing. The objective is to standardize the system or management of planned maintenance throughout the operating forces. This applies to ships as well as aircraft. It covers the development and implementation of (Plan A) the MRC system previously discussed with Plan (B) the Maintenance Data Collection system (MDC).

The MDC will be a very comprehensive reporting system and is based upon AFM 66-1 (Air Force Manual 66-1) which is credited with placing many B-52s back on the line which otherwise would have been lost or down through inefficiency. Periodic inspection time was cut from 11½ days to 3½ days.

A pilot program has been in operation at NAS Oceana for several months to determine the most appropriate mode of reporting applicable to naval weapons systems. At this time, the exact system is still under study and many problem areas must be resolved prior to implementation on a Navy-wide basis. The Fleet Work Study Groups on each coast have more detailed information and are providing MRC/MDC training for fleet units.

An interesting requirement is the manpower accounting system which supplements the maintenance data collection. Maintenance man-hours are to be accounted for by Exception Time Accounting (ETA). Essentially an Exception Time Card will be filed each time a maintenance man must leave his assigned job.

All data after it is collected by different commands will be processed in a centralized data reduction center. The Center will process and analyze all collected data by an Automatic Data Processing system (ADP). Results can be used to justify budgets, procurements, manpower requirements, quality considerations, and the many other predominant needs of an age of great mechanization. Look for more on this in '64 and '65.

BuWepInst 4700.2 is Bible

All in all, 4700.2 remains the bible for aircraft maintenance. Revisions are required and will be forthcoming at an early date from BuWeps. This working document should continue to be the basic source of maintenance direction pending revisions modified by implementing directives in the areas discussed.

Conclusion

It has been shown that new organizational and administrative methods are being implemented to standardize the maintenance effort, to improve its effectivity, to actually do a better job at no sacrifice in quality of maintenance or safety; actually, it is hoped, with improved safety. No job should be done that doesn't need to be done. No inspection made that is unnecessary. Limited talent and manpower must be utilized to do only those tasks that need to be done, combining like skills in integrated shops, and like aircraft and systems at the same base where possible.

These methods lead to most effective application of the industrial and technical aspects of aviation maintenance for a peace-time tempo of operations and training. Such changes have been made necessary by limitations in funds and manpower in an age of ever increasing complexity and automation.

Perhaps in time of war other plans may be in order for the maximum dispersal of forces; but, for the present time, the pursuit of a standard maintenance program reflecting the most effort for the least money has been directed.

A "can-do" attitude fits with this requirement. Naval Aircraft Maintenance is on the move to do its part. Your personal support is solicited.

CDR Rasmussen graduated from the Naval Academy, Class '43. Served during World War II on a World War I DD in the Aleutians and Solomon Islands. Flight Training in '44, with a year as instructor in PBY's. VP-47 for two years in PBM aircraft. PG school 1948 to 1951. Graduated University of Minnesota with MS in Aero Engineering. VP-44 from 1951 to 1953 in P5M aircraft. Then headed the M&M Dept. at NASC until 1956. BuAer and BuWeps followed as Head, Shaft Power Engines Branch where he had a lot to do with improving the R1820 and R3350 Engines, the new detergent (dispersant) oil, chip detector, and new engine developments such as the T-58 and T-64. He reported to ComFAirHawaii in July of 1960 as Asst. Chief of Staff for Maintenance and Material. He Joined ComNavAirPac Staff in August 1963 as Aircraft Maintenance Officer.

Flight Engineering the C-130

It has been rumored, at a certain MATS base located near where the first shot of the Civil War was fired, that being assigned to the C-130E will be a snap — a real breeze of a job — for the flight engineer (FE). I will agree that the knob and lever pulling workload is practically non-existent, but there is plenty of work to be performed by the FE aboard the *Hercules.*

Let's talk about a few of the contributions a flight mechanic can make. First of all, he must realize he has no kingdom — no separate panel. This changes his flight workload from one which required physical dexterity to a task possibly

By Al Barrett
Chief Engineer
Lockheed-Georgia Company

Flight Engineer J. M. Larkin, ADRC of VR-22, inspects the engine turbine area, far left, and the engine air intake area, middle left, mans the flight engineer's station, middle right, and demonstrates inspection of landing gear emergency extension system, far right.

more difficult — that of continuous scanning. It is a task very much like that which is required of a pilot during instrument flight. It is smart business to have someone watching system performance, specifically, just in case one of these automatic goodies doesn't perform as advertised.

Let's take things in a rather loosely knit order starting with the preflight inspection. A hazard that may be new to many of you who have not dealt with a turbine engine before will be (F O D) — Foreign Object Damage. The C-130 engine air intake is about the height of two tall Indians from the ground, so the odds are high against pulling anything damaging into it from terra firma. But, you had better look into the big fish mouth because of the objects that may be left there by people. If a wrench is left in the cowl area of an R-3350, it may never give you any trouble; but, in the case of a T-56 engine, I can guarantee you a bushel basket full of compressor blades. Remember, this plane is going to be new to the maintenance folks too.

One of the most critical times in the life of a turbine engine is during start. But it can also fail the last 10 seconds of the last run. It is a good idea to have a look at the hot end of the thrust producer to see if all the turbine blades are in their proper place and in their proper shape. There are a few other things to look at during preflight and they are all well outlined in the handbook. Getting up to see in the intake and turbine area involves a bit of stand or ladder wrestling, so you can be sure it is going to be the flight engineer's job to do it.

History of the C-130 has shown us that one thing we should be alert for is the possibility of doing damage to the aircraft because of uncontrolled hot air — and I don't mean the kind that comes from a *homo sapiens*. I refer to the air coming from the engine or gas turbine com-

pressor under pressure and at a temperature of 500° to 600°F. Once you call for the air to move into ducts of the pneumatic systems, you should shortly thereafter make a duct leakage check. This test will show if you are about to burn up a batch of wire bundles because of a loose clamp or split duct. The procedure is outlined in Section IV of the handbook.

I've heard it said that the engine starting procedure of the *Hercules* is ridiculously easy. You move a few knobs and levers, hold the starter button in for 3 seconds – then sit back and worry. Not so. The crew must give this routine as much attention as it does to making sure the per diem payments are correct. Here is where the FE can make a great contribution to engine life by helping to spot stalled or hot starts.

During the before takeoff check, a fault may be noticed from one of the 36 engine instrument indicators. The flight mechanic must know and quickly move to check the electrical circuit protection if, after cross-checking, it appears to be an instrument indication problem. If circuit protection is OK, his next step is to switch like instruments. This can be done easily with the help of a cross-point screwdriver, a pair of diagonal pliers, and a cannon plug persuader. If the instrument is transistorized, all he will need is the cross-point.

Most flight mechanics know they are supposed to do a nice gentle job with pressurizing after takeoff. This becomes more important because you have so many people coming up for retirement in the next few years. I have found I can reduce surges while closing up the cabin by directing the safety valve closed first. This eliminates one moving valve during the pressurization transition. If you know the system, the steps used to do this will be obvious.

Fuel management may look like kid stuff, but after familiarizing yourself with the notes on the weight limitations chart, the fuel distributions effects paragraph in Section V, and the fuel management information in Section VII of the Flight Manual, you may change your mind. Loss of a wing tank boost pump could keep you a little busy if you are to comply with all the Flight Manual recommendations.

The *Hercules* lends itself to inflight troubleshooting and maintenance as well as any airplane I have ever seen. Generator control units can be interchanged easily, if you are not too obese. Leaking hydraulic units can be isolated. Malpositioned pneumatic valves can be pinpointed visually. Door warning switch faults can be cured rapidly. I don't mean to imply you should rebuild the machine in flight, but you can go a long way in preventing another mission abort for the "want of a nail" or because of the lack of a little system knowledge and know-how.

This airplane is like any other seesaw that flies. It has its weight and balance limitations. These, and the loading and tiedown capabilities of the airplane should be known by the flight mechanic as well as the loadmaster.

You will hear that this airplane can be cruised by knowing only one number. It may be 300 TAS or 932° turbine inlet temperature. This one number bit comes from not wanting to get away from 30" Hg. and 2000 rpm, which fits pretty good for most base flight airplanes with bang-bang engines. Because you cannot vary prop RPM and play with the fuel air ratio, people tend to believe there is no need to apply cruise control techniques. Well, this bird has an optimum lift-drag ratio just as any other winged vehicle and power applied should be planned.

From time to time, it may be necessary to make a few entries in the Form 781 and here is where the well-informed mechanic pays off. Backed up by your basic mechanical knowledge, your knowledge of the C-130E should make for clear and informative write-ups. In fact you can supply that missing link between the point where malfunction occurs – in flight – and where somebody must fix it – on the ground.

During my plagiaristic preparation for this article, I had occasion to read many flight journals. About every other paragraph had the word "professional" in it. I think it can be applied to the point I am trying to make here. The flight mechanic in the C-130E can attain a reputation as a high paid coffee carrier, or attain professional status. It is up to him!

About the Author

Al Barrett's life has been aviation. Joining Lockheed-Georgia in 1955, he participated in the original acceptance flight of the first C-130A and has been a fan of the Hercules ever since. Promoted to Chief Flight Engineer in 1959, Al holds an FAA commercial pilot license, a flight engineer license and an aircraft and engine mechanic license. Well qualified to write on this subject, Mr. Barrett also has military combat experience as a rated pilot.

MAN'S ETERNAL STRUGGLE
With the Machine

THE MODERN aircraft is made up of more little bitty vital bits and pieces than you can count in a week. Each one plays its little bitty vital role in keeping things like they are supposed to happen. The ordinary Joe, engrossed in his "little bitty" job of looking after his chore of doing what he is supposed to do never really grasps, gets, sees, feels or realizes what the big picture looks like.

Take a pilot—arrives at the flight line at 0630—coffee, briefs, leaps, lands, writes-up, coffee, chats—so it's a good day.

Take a crew chief—arives at the flight line 0430—coffee, checks, preflights, launches, waits, coffee, parks, corrects, chats—another good day.

Thank the Lord, the above two paragraphs are typical of the majority of our pilot/crew chief combinations. But I'm sure neither is fully aware of what it really took to bring about such a successful day. Both are well-educated people, both are fully dedicated and motivated individuals, both are completely absorbed in their jobs and both are doing it well. This is as it should be!

Involved in this launch/recovery routine were several more people—electricians, armorers, hydraulic mechanics, machinists, sheet metal workers, radio mechanics, engine men, oxygen troops, refuelers — I could go on and on, but let any one of them slip, relax, or goof and the stage is set for one of them things I refer to as a real DO. Some examples to prove my point:

a. ". . . my touchdown was normal, good chute, everything OK, except the crosswind was drifting me to the right a tad. I got on the left binder but had absolutely no feel, glanced at the gage and found a big fat ZERO. I was slowing down good so I dropped the chute but I was still drifting slowly to the right. What can you do? Sit there and sweat and hope for the barrier—right? Well, I got the barrier alright, right on the frappin' nose, only problem was I hit the stanchions on the right side of the runway and crumpled the nose gear—going over 15 knots, but I'd had the course."

b. ". . . we had just leveled off when I noticed the oil pressure light. I told Lead and he called us to Guard for an immediate penetration to . . . Air Patch which was dead ahead at 30 miles. Throttled back and was doing real fine when we broke out at 3000 about 10 miles out. We were a little low, but when I reached for power, I ain't got any, Dad—that hardware had started to glue up and we just

couldn't get there from here. I hated to leave (Okay, so I'm chicken), but that big flat field looked friendly and 'sides I hoped to salvage some of it, 'cause this oil pressure thing had been buggin' us for quite a spell, ya know. Anyhow, I sucked up the garbage and plunked her in with no sweat—bent the bird but had enough left to look at. . ."

c. ". . . I rolled into a LABS at Flight Level 280—kind of a Split-S, see, and I overshot a tad. So I came off on the power and sucked it in to salvage the run. Just back on when ZAPP, I heard

or felt a thump. About then I noticed the old RPM heading south. Tried to catch it but couldn't, so I aborted the run and told Hoss of my problem. We went through 5 attempts to get a light and that's all she wrote—the Arabs were real friendly though."

d. ". . . just as I rotated, something knocked my foot off the right rudder pedal, so I aborted. After getting off the active, I found about a 20-pound hunk of *blacksmith iron* laying on the floor."

e. ". . . was all set to crank when I noticed this Q.C. type waving his arms. He came up the ladder and told me that something was running out the bottom and not to start until he found out what. Then I got the signal to cut. Yeah, the launch crew thought JP-4 was coming out of the wing drains. That's a laugh."

f. ". . . Tower I've lost Number 2 and am feathering."

"Roger—all aircraft in. . ."

"Tower, unable to feather, landing straight ahead, wheels-up."

"Understand, will send assistance."

"Crash, smoke appears to be in grid number FOX NINER—expedite!"

The above are some random samples of not so routine flights. EXAMPLES "b", "c" and "f" ended up as major accidents. Example "a" was charged off as a minor accident, and examples "d" and "e" were near misses.

Here are some of the details which brought all this about:

a. Loss of brakes was caused by a locally manufactured hose that was 5 inches too long. This extra length was rubbing against the rotating wheel when it was in the well. The hose ruptured and lost all hydraulic fluid.

b. Improper assembly of the engine oil filter caused loss of all oil, loss of engine and loss of bird.

c. An open-end wrench lodged somewhere in the intake shook loose during this maneuver and wiped out the compressor.

d. The blacksmith iron had been used to "weigh down" a piece of Micarta forward of the rudder pedal and had been forgotten and overlooked by all concerned.

e. The old bugaboo—a loose B-nut caused all the JP-4 to leak out everywhere except the wing drain!

f. A cracked prop feathering line elbow forced this pilot to contend with a windmilling engine. Overtorque caused the cracked fitting.

In every one of these instances maintenance slipped, relaxed, or goofed on some vital detail and an accident was set up for happening. Every day accident boards are revealing similar type things. Hundreds of others are being found by hundreds of other people, but never reported.

What can we do about it? Don't skip anything on an inspection. Publicize as much as possible. Pass the word. Put all maintenance errors in cinemascope—like the big picture. Let all of our maintenance troops profit by the knowledge of what others have found out—the hard way.—*USAF "Airscoop"*

TROUBLESHOOTING

TROUBLESHOOTING of any component or system is the systematic examination of the component or system to find the cause of the malfunction. For any malfunction or trouble there are usually several possible causes. To change all possible faulty components is not only wasteful, but time consuming. Every minute spent on changing a component operating properly is time wasted. To stop this waste, experienced maintenance personnel troubleshoot or examine the malfunction before beginning maintenance.

In order to troubleshoot any component or system, the man performing the maintenance must first thoroughly understand the design, function, and operation of the system or component he is responsible for maintaining.

The first step in maintenance then is to analyze those facts known, and attempt to find some key, or to find a similarity with another malfunction with a known cause. For this reason, the experience of the troubleshooter greatly increases his worth. Knowledge of the proper operation of the system is a necessity, and familiarity with abnormal system operation is helpful. If the mechanic recognizes the cause of the malfunction, he can proceed immediately with corrective action. If, however, he does not recognize the cause, he must carefully and systematically eliminate every possible cause until he has found the faulty component.

This systematic elimination is the measure of the troubleshooter. To change every component in the system may solve the problem, but it has taken much time, drawn heavily from supply and has not helped if the same malfunction appears again. Sooner or later, the needless and wasteful replacement of serviceable parts will become old and it will be necessary to find the cause, so why not start troubleshooting properly the first time?

As the troubleshooter goes through the system, he uses every technical manual and report available which may contain a clue concerning this cause. He also consults other maintenance personnel to see if they have experienced a similar malfunction. Remember, two heads are better than one.

After a thorough investigation and analysis, the troubleshooter makes his decision. He now changes the faulty component or, if he finds that linkage was the cause, he adjusts the linkage. Now he repeats the ground operational checkout. If, after a complete checkout, the malfunction has not recurred the aircraft is ready for any further necessary flight testing. — *Delta "Technical Review"*

This is Troubleshooting?

SOMETIMES performing the obvious provides the solution. No need to make mountains out of molehills. Yet, when it comes to coffee makers on transports such as the 707, 990 or an *Electra,* for that matter, a certain air line blushed at the troubleshooting finesse of some of its mechanics.

During a single month when 74 bean renderers were yanked from the airframe 37 or one-half of them were found to need only light bulbs! It kinda makes one wince to mention this, but a troubleshooter, when eye-to-eye with dead bulb, might try changing same. No use to ramble off into a component change, circuit search and ohmmeter sleuthery without first checking the gadget on the end of the wire. Besides, bulbs are easier to carry across the ramp than a magic wonder coffee boiler.

Perhaps even professional mechanics in this man's Navy can recall a similar experience but for pride would prefer to forget it.

Letters

Re Your Signal Divert

FPO New York—Considerable comment was aroused in our squadron concerning the divert article in the March issue. We feel that the crew of the A-3, presumably lost at sea, would have been able to make a controlled bailout over the divert strip if the bombardier/navigator had carried a knee pad size folder containing adequate radar scope photography of the approach to the field.

On our last cruise we collected such photography for 25 divert fields from a variety of possible approaches. A folder of the annotated radar scope photography along with a chart of the area, runway diagrams and optical photography was distributed to the B/Ns and updated as better quality film was taken. These handouts enabled positive identification of the area of the field on radar from over 100 miles away, regardless of weather, and the B/N was able to navigate the aircraft to the end of the runway.

We believe that an experienced crew could accomplish a radar approach to most fields in 200/1/2 conditions. Of course a safe landing would depend on many other factors, but at the very least the crew could make a controlled bailout directly over the field.

Copies of the folder have been sent to CNO, PIC and HATWing One. The radar scope photography has been incorporated into the Integrated Operational Intelligence System and is available to fleet aviation units.

J. L. SHIPMAN, CDR
CO, VAH-9

Strange Language

APO San Francisco — APPROACH is probably the most widely read safety publication in Army Aviation. All service publications are available and usually thumbed through to see if anything catches the eye. APPROACH is aggressively sought out and read from cover to cover.

Although only a few aircraft (mostly rotary wing) are common to both services, the principles of *heads up* operation are common to all who venture into the blue (or grey, or black) yonder. The Anymouse reports articles by people who had trouble and were able to either prevent an accident or survive, and other hairy tales plus the educational articles make APPROACH a valuable tool in the business of increasing professionalism and therefore combat effectiveness.

We do have one slight problem, however. This is trying to figure what such initials or abbreviations as FCLP, VMF, BACSEB, CIC, DRT (and a hundred others) mean. I am sure these are as familiar to Navy jocks as the color of their wives' eyes but we who fly low and slow are not able to understand this strange language.

THOMAS W. WHEAT, JR.
CAPT, ARTY
CO, AVN DET 7LOG/EUSA REAR

• We'll attempt to reduce the the amount of *strange language*.

Shroud Cutter

Norfolk, Va. — OpNav Notice 3510 of October, 1963 suggested that further study be made of the best location for the survival knife and shroud cutter for personnel using the torso harness. This command has simulated the use of the shroud cutter in various locations with the flotation equipment inflated and found the most desirable position, that shown in top photo. This location provides the pilot with immediate extraction and minimum interference of the oxygen hose assembly and flotation equipment.

It is recommended that the survival knife and shroud cutter be redesigned as a single blade in the fixed open position. A shroud cutter similar to that shown in bottom photo would provide the pilot with little difficulty in making instant use of the cutter. A few seconds' delay in opening the survival knife could prejudice survival.

D. H. WILLIAMS
CO, VRF-31

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request. Address: APPROACH Editor, U. S. Naval Aviation Safety Center, NAS Norfolk, Va. Views expressed are those of the writers and do not imply endorsement by the U. S. Naval Aviation Safety Center.

• Your design and location of a shroud cutter knife are considered logical and sound. The Safety Center looked into this matter further and found that the Air Force presently uses a similar knife called a "lanyard cutter pocket assembly." We have recommended to BuWeps the acquisition of this Air Force knife.

Be Our Guest

MCAS, El Toro — VMT-2 would like permission to reproduce a number of articles that have appeared in past issues of APPROACH magazine. Our intention is to collect several articles of a pertinent nature to our type training and compile a booklet for handout to our students.

A. W. ANTHONY
VMT-B

• **You, as well as any other Navy or Marine activity, are most welcome to reprint any of the APPROACH in your units publications. Permission is only required from organizations which are not part of the Navy or Marine Corps.**

We would appreciate your forwarding a copy of the various booklets to us, for these will indicate which articles have been most useful to your type squadron. In this manner we can better anticipate the requirements for a proper balance of approach material for our various audiences.

Such information also sometimes suggests to us that certain articles are worth reprinting in the magazine, or providing separate reprints for Crossfeed and other special distribution.

Flight Gloves

Meridian, Miss. — This Command has been issued a quantity of Air Force summer flight gloves through the flight gear pool. Several pilots have expressed dissatisfaction with the Air Force type flight gloves currently being issued at the Central and Branch Pools in the Pensacola complex. Their reasons are:

- They resemble the previously condemned brown Navy flight gloves which did not possess the fire retardant qualities required.
- Pilots' hand signals are harder for plane directors to see because of the dark color of their gloves.
- Naval aviators resent having to wear flight gloves marked with Air Force insignia. (We have noted that the Air Force and Navy gloves have the same Mil. Spec. Mil-G-9087 A.)

Any information you can give us on this matter would be greatly appreciated. I enjoy reading APPROACH and find it most informative.

RIGGERMOUSE

• **The only glove authorized for naval aviators is the cream colored glove as listed in Section "H." Yours is the second report of Air Force gloves in the Navy supply system. The Safety Center has requested that the cognizant authorities look into this and advise BuWeps and the Aviation Supply office of their findings.**

Pencil Flare Gun

Jacksonville, Fla. — What is the latest status of the pencil flare gun pictured in the February APPROACH, p. 23? Some time ago I came across the designations EX-79 Kit, Signal projector EX-31 Mod O and Signals EX-80 Mod O which I assume refer to the flare gun. If I am referring to the same thing, I believe these were distributed some time ago by AirLant/Pac to some units for evaluation.

What's the dope on them? Have they been accepted as a standard stock item? If so, what's the stock number and price? If not, is there something in the mill to replace them? When and how will this become available? What I'm searching for is a "suitable signaling device" which will meet the NATOPS requirements for a ".38 cal. pistol with tracer or suitable signaling device." While not denying the merits of the .38, the availability and accountability of this item is a constant headache. How about some words of wisdom?

R. K. CULBERTSON, LCDR
ASO NARTU

• **The fleet evaluation of the pencil flare gun was extremely favorable. At this writing the gun is not in the supply system; contracts are being let. Words of wisdom? Why not put the requirement for the pencil flare gun in as a NATOPS agenda item?**

"I don't mind giving up the wine and women, but I'm the leading tenor in the HAPPY HOUR HOOLIGANS!"

Tire Shop Note

NAS Patuxent River — Suggest a couple of modifications to the Aircraft Wheels — Tires — Tubes, Poster C12 G1 1163: (1) Add to item (a) under Removal from Aircraft, "Install Safety Flag in accordance with NavWeps 04-10-506, p. 5 — 1, Fig. 5 — 1."

(2) Under "Inflation" item (a) delete "Checking and." The sentence should now read: (Storage pressures are always Low Pressures).

Confusion may result from "checking" pressure in that this is higher than both storage pressure and operating pressure. These are important items in my shop because so many people are not aware of the serious hazards presented by handling wheels with high pressure air.

R. L. STUDEBAKER, AMHC
TIRE SHOP, AMD

• **Right you are, Chief. The next printing of this poster will incorporate these changes. In the meantime, we ask that you gents running the Tire Shops make pen and ink changes to your present poster.**

Baggage Binder

Los Angeles — As stated in your article (The Eternal Question, March 1964) "There are no *known* aircraft losses or fatalities due to misplaced baggage, but a few incidents and hairy tales have resulted." Here is an Air Force tale that was not only hairy, but fatal.

Several years ago a T-33 departed a western field with a non-aircrew passenger on emergency leave. As there was a lack of storage room in the nose and no baggage pod attached, it became necessary for the passenger to get into the rear cockpit and have the crew chief hand him up the B-4 bag and hold it on his lap (first and last mistake).

After takeoff and starting the initial climbing turn out of traffic, the pilot experienced difficulty in obtaining back travel on the stick. As the bank increased the situation worsened and the aircraft could not gain sufficient altitude to clear the surrounding low hills. It crashed a short distance from the field.

Upon investigation it was learned that the passenger, not realizing what can happen if you don't ask questions, saw the large space between the seat and the control stick and put the B-4 bag there. It was not really noticed until the pilot cleaned up the aircraft after takeoff and tried to gain altitude. When the control stick was pulled to the rear the bag and seat failed to give.

AIR TECHNICIAN, USAF

NAVAL AVIATION SAFETY CENTER

approach

NavWeps 00-75-510 VOL. 9 NO. 12

Our product is safety, our process is education, and our profit is measured in the preservation of lives and equipment and increased mission readiness.

Flight Operations

48

Aero Medical

Maintenance

Departments

Credits:

Page 31 Chart, K. M. Nevel, DM1

Purposes and policies: Approach, published monthly by the U. S. Naval Aviation Safety Center, is distributed to naval aeronautical organizations on the basis of 1 copy per 10 persons. It presents the most accurate information currently available on the subject of aviation accident prevention. Contents should not be considered as regulations, orders, or directives. Material extracted from mishap reports may not be construed as incriminating under Art. 31, UCMJ. **Photos:** Offical Navy or as credited. Non-naval activities are requested to contact NASC prior to reprinting Approach material. **Correspondence:** Contributions are welcome as are comments and criticisms. Views expressed in guest-written articles are not necessarily those of NASC. Requests for distribution changes should be directed to NASC, NAS, Norfolk, Va. 23511 Att: Safety Education Dept., if you are receiving the magazine free because of military or commercial contract status with the Navy. . . . IF YOU ARE A PAID SUBSCRIBER, address all renewals and change of addresses to Superintendent of Documents, Washington 25, D. C. **Subscriptions:** Single copy 35 cents; 1-year subscriptions $3.50; 2 yrs., $7.00; 3 yrs., $10.50; $1.00 additional annually for foreign mailing. **Printing:** Issuance of this periodical approved in accordance with Department of the Navy Publications and Printing Regulations, NAVEXOS P-35. Library of Congress Catalog No. 57—60020.

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RHIP... RHIR

Rank has its privileges. . .
Rank has its responsibilities.

This quote, from the now out of print Navy Pilots' Information File (NavAer 00-80-T-33) is as good today as it was years ago.

Your rank is the absolute command of the airplane you fly. Your privilege is to refuse the plane for flight at any time you have reason to believe the aircraft, any of its equipment, or any of its crew is not safe for flight. Having that privilege, you also have responsibilities. These responsibilities include:

To the Navy. (1) To conscientiously exert your energies and abilities to the safe and purposeful handling of your aircraft.

(2) For the security of your aircraft when left on a field, beach, body of water, or other area where naval or military personnel cannot take custody; or in case of an accident, until you are relieved of the responsibility by proper authority.

To yourself. (1) To maintain your proficiency as a Naval Aviator.

(2) To avoid conduct which would in any way reflect on your integrity as a naval officer.

To your crew. (1) To instruct and drill your crew in abandoning and ditching procedure.

(2) To see that all emergency equipment, life rafts, life vests, and parachutes for each crewmember or passenger are aboard the plane and that each individual knows how to use them. . .

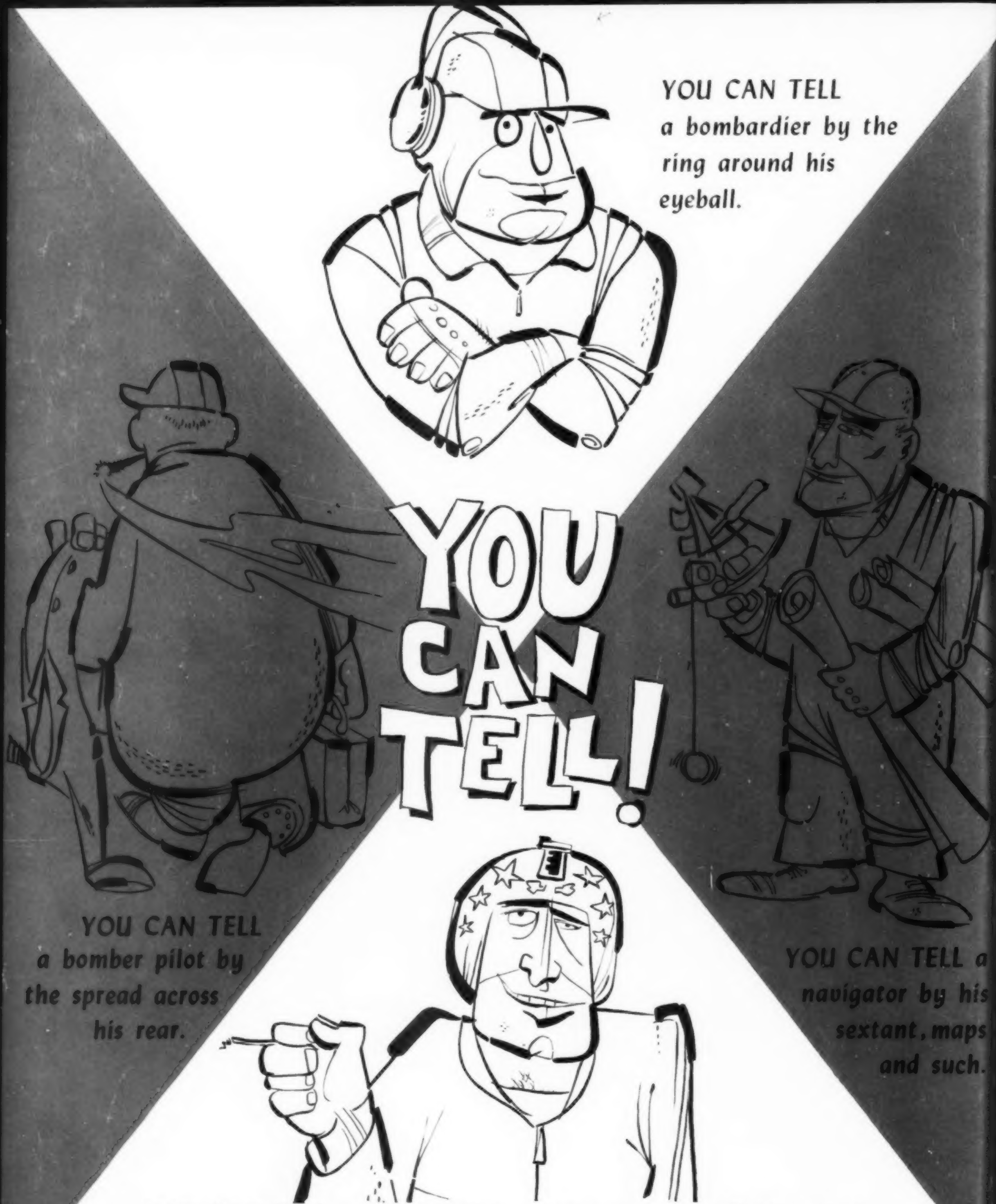
To other pilots. (1) To follow your flight plan as filed or to notify an airways air/ground station in case of a change of flight.

(2) To give other planes wide berth for clearance when passing in flight.

(3) To report to medical authorities when for any physical or mental reason you feel unfit to fly.

To those pilots who will fly the same aircraft. (1) To report any discrepancies or failures you may encounter while flying the plane.

(2) To report all instances in which you fly the plane in excess of operational limits.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YOU CAN TELL a fighter pilot ... but you can't tell him much.
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